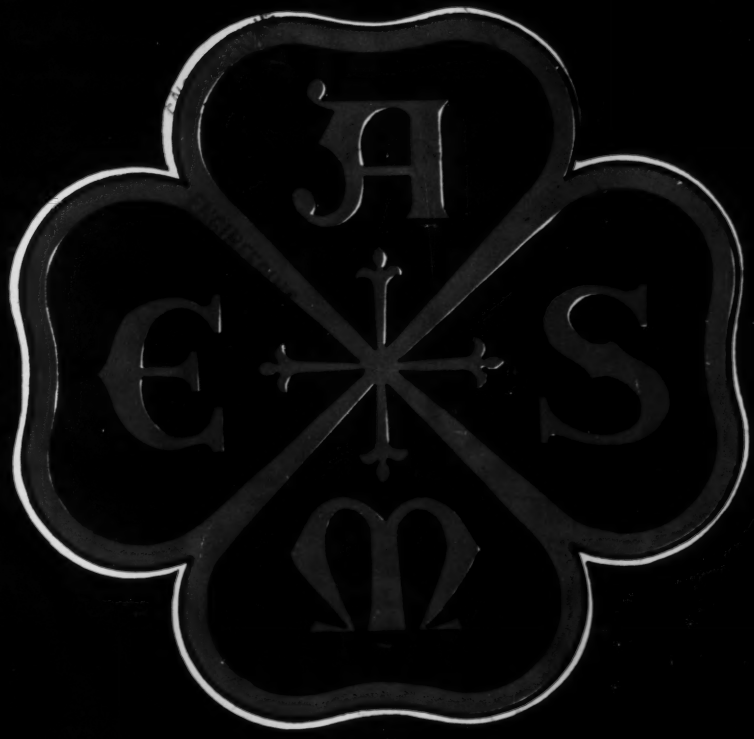
MECHANICAL ENGINEERING



January 1945

HOW DOES YOUR BOILER PLANT RATE ON *THESE* POINTS?

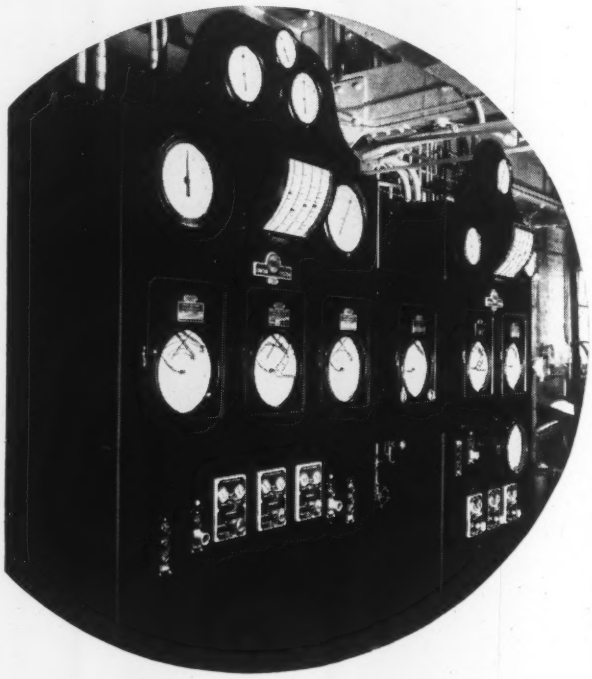
1. CONTINUITY OF SERVICE.
2. EVAPORATION RATIO.
3. SAFETY OF OPERATION.
4. PEAK STEAMING CAPACITY.
5. UTILIZATION OF AVAILABLE MANPOWER.

★Optimum performance may be secured on all these counts by applying engineered instrumentation in the form of Bailey Boiler Meters and Control.

Bailey Boiler Meters and Control are specified and applied to the individual requirements of each plant. Bailey engineering service starts with the selection of equipment and continues through the design, construction, calibration, installation, and final adjustment on the job.

Engineering work in the user's plant is done by Bailey Field Engineers, who have been thoroughly trained in combustion and automatic control practice. These engineers are stationed in over thirty industrial areas throughout the United States and Canada for the purpose of rendering prompt "on the spot" engineering service without undue traveling expense.

The Bailey Engineer in your community has a background of combustion engineering "know-how" which has been accumulated through years of service. He has at his command the results of thousands of tests on boiler installations covering a wide range of fuels, furnaces, and fuel burning equipment. He has more to offer than meters and controllers. He is primarily interested in helping you to secure optimum operating conditions in your plant.



Installation of Bailey Boiler Meters and Boiler Control in an Eastern paper mill. This equipment automatically functions to maintain daily boiler performance at the same high standards obtained during boiler tests.

BAILEY METER COMPANY
1026 IVANHOE ROAD • CLEVELAND 10, OHIO
Bailey Meter Company Limited, Montreal, Canada

BAILEY METER CONTROL

BOILER METERS • MULTI-POINTER GAGES • FLUID METERS • RECORDERS • SUPERHEAT CONTROL • DESUPERHEAT CONTROL • COMBUSTION CONTROL • FEED WATER CONTROL

BAILEY METERS

The Complete Combustion Control System

MECHANICAL ENGINEERING

Published by The American Society of Mechanical Engineers

VOLUME 67 NUMBER 1

Contents for January, 1945

ENGINEERS OF TOMORROW . . . . . *R. M. Gates* 5
POSTWAR EMPLOYMENT OF VETERANS . . . . . *W. C. Rose* 9
PROBLEMS OF RETURNING SERVICE MAN FROM LABOR VIEWPOINT . . . *C. S. Golden* 12
INDUSTRIAL JOBS FOR RETURNING VETERANS . . . . . *S. M. Lowry* 14
VETERAN RE-EMPLOYMENT—COMMENT ON THREE PAPERS . . . . . *D. M. Mason* 17
AN EXPERIMENT IN MANAGEMENT EDUCATION . . . . . *R. C. Muir* 19
UPPER MANAGEMENT IN TRAINING . . . . . *G. R. Cowing* 21
THE CONTRIBUTION TO ORDNANCE RESEARCH AND DEVELOPMENT BY TECHNICAL ASSOCIATIONS . . . . . *L. H. Campbell, Jr.* 23
HEAT-STABILIZED COMPRESSED WOOD—(STAYPAK) . . . . . *R. M. Seborg, M. A. Millett, and A. J. Stamm* 25
POSTWAR FEDERAL TAXES . . . . . *R. E. Freeman* 32
DEPENDENCE ON STRESS OF DAMPING CAPACITY OF ALLOYS . . . . *Andrew Gemant* 33
TO A.S.M.E. MEMBERS: THE COUNCIL REPORTS FOR 1944 39
A.S.M.E. FINANCE COMMITTEE REPORT, 1943-1944 44
HOW THE A.S.M.E. SPENT ITS INCOME IN 1943-1944 48
1944 A.S.M.E. ANNUAL MEETING 50

EDITORIALS 3
A.S.M.E. NEWS 70
CONTENTS OF A.S.M.E. TRANSACTIONS . 88

INDEX TO ADVERTISERS 134
CATALOG BRIEFS 27–50

OFFICERS OF THE SOCIETY:

ALEX D. BAILEY, *President*

K. W. JAPPE, *Treasurer* C. E. DAVIES, *Secretary*

PUBLICATIONS STAFF:

GEORGE A. STETSON, *Editor* FREDERICK LASK, *Advertising Mgr.*

K. W. CLENDINNING, *Managing Editor*

COMMITTEE ON PUBLICATIONS:

E. J. KATES, *Chairman*

L. N. ROWLEY, JR. H. L. DRYDEN

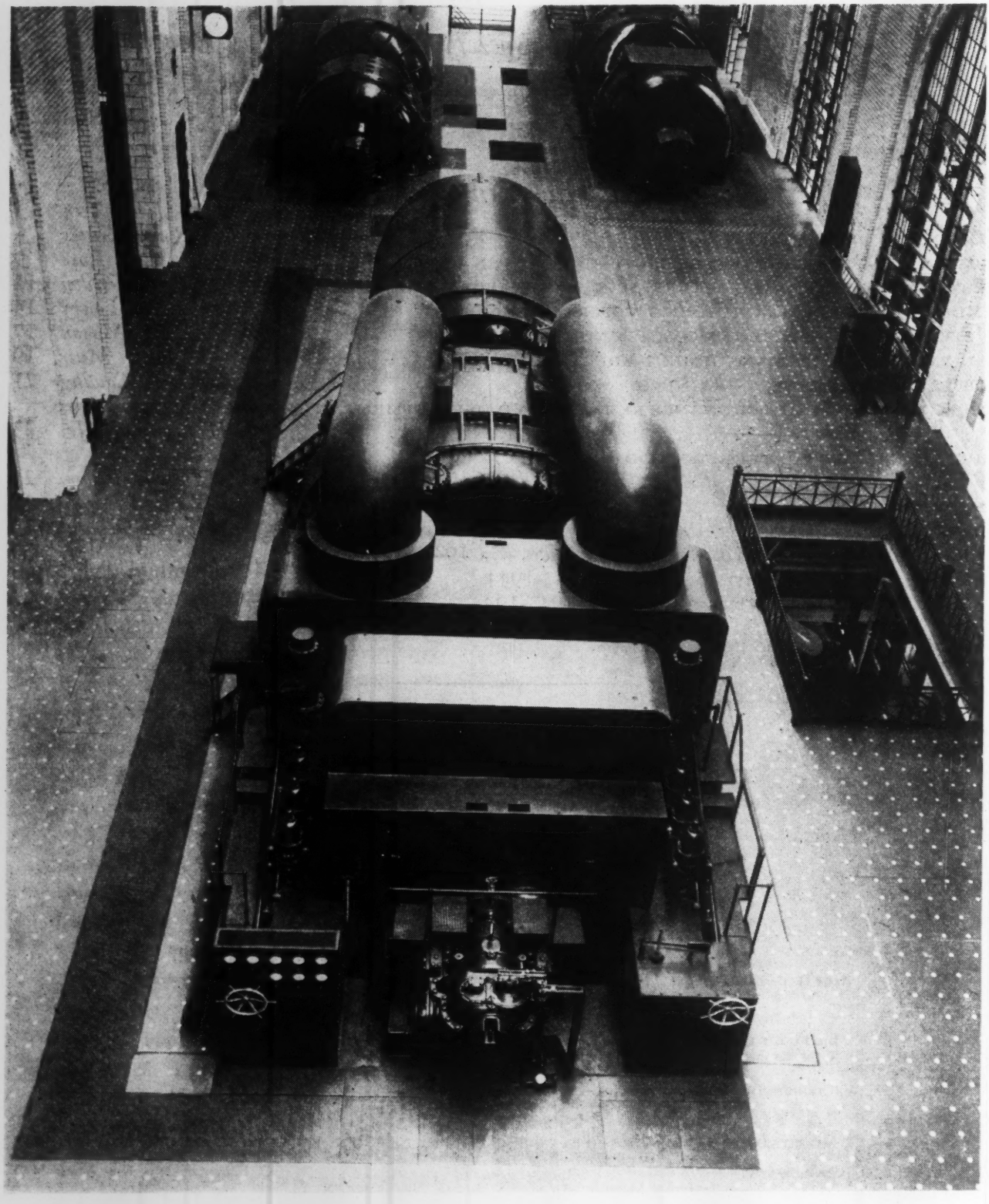
W. A. CARTER J. M. JURAN

ADVISORY MEMBERS OF THE COMMITTEE ON PUBLICATIONS:

N. C. EBAUGH, GAINESVILLE, FLA. O. B. SCHIER, 2ND, NEW YORK, N. Y.

Junior Member: RICHARD S. BIDDLE, NEW YORK, N. Y.

Published monthly by The American Society of Mechanical Engineers. Publication office at 20th and Northampton Streets, Easton, Pa. Editorial and Advertising departments at the headquarters of the Society, 29 West Thirty-Ninth Street, New York 18, N. Y. Cable address, "Dynamic," New York. Price 75 cents a copy, $6.00 a year; to members and affiliates, 50 cents a copy, $4.00 a year. Postage outside of the United States of America, $1.50 additional. Changes of address must be received at Society headquarters two weeks before they are to be effective on the mailing list. Please send old as well as new address. . . . By-Law: The Society shall not be responsible for statements or opinions advanced in papers or . . . printed in its publications (B13, Par. 4). . . . Entered as second-class matter at the Post Office at Easton, Pa., under the Act of March 3, 1879. . . . Acceptance for mailing at special rate of postage provided for in section 1103, Act of October 3, 1917, authorized on January 17, 1921. . . . Copyrighted, 1944, by The American Society of Mechanical Engineers. Member of the Audit Bureau of Circulations. Reprints from this publication may be made on condition that full credit be given MECHANICAL ENGINEERING and the author, and that date of publication be stated.



New Unit 17 at Commonwealth Edison Company's Fisk Street Station, Chicago

VOLUME 67
No. 1

MECHANICAL ENGINEERING

JANUARY
1945

GEORGE A. STETSON, *Editor*

Treasurers

FOR a period of sixty years The American Society of Mechanical Engineers has had only three treasurers. Major W. H. Wiley was elected in November, 1884, and served until the time of his death in 1925. In his first report as treasurer, Major Wiley informed members of the Society that something less than $10,000 had been expended during the year. By 1925 the income had reached $670,500, expenses $572,000.

Erik Oberg succeeded Major Wiley as treasurer, and during his ten years of service the worst depression of history developed. For several years, revenue decreased much more rapidly than expenses could be cut and membership fell numerically as engineers suffered from economic uncertainty and disaster. By the time Oberg resigned in 1935, income had been cut in half but the Society was weathering a long-continued period of stress owing to the efforts of loyal and hardheaded men like the treasurer, his fellow officers, the Council, and other members who gave their services to the full without recompense and with small thanks.

When W. D. Ennis became treasurer in 1935 he was the Alexander Crombie Humphreys Professor of Economics Engineering at Stevens Institute. Engineering graduates of the early part of the century remembered him as the author of an excellent book on thermodynamics and of other textbooks. Conservative and objective-minded, Ennis aided in the task of putting the finances of the Society on a realistic basis. Accounting practices which had been satisfactory under predepression stabilized conditions were made to conform to the needs of uncertain times. Investment portfolios were revised with the object of providing security and liquidity. And as income increased with the expansion of Society membership and greater revenue from advertising, the building up of a surplus that would be readily available at 100 cents on the dollar in time of future need was undertaken. As the report of the Finance Committee, pages 44–47 of this issue, shows, that surplus reached a value of $390,000 by the end of the fiscal year 1943-1944. His task successfully completed, Ennis relinquished his post in December, 1944. To him the Society owes a debt of gratitude, because the A.S.M.E. can face the postwar years with confidence that its financial future has been made as secure as it is humanly possible to make it under the conditions that have prevailed during the years of recovery from the depths of the depression.

The new treasurer, K. W. Jappe, who was elected to succeed Dr. Ennis, has just completed an eight-year term of service on the Finance Committee. Closely allied to Dr. Ennis in spirit and in the objective of placing the Society's finances on a sound basis, Mr. Jappe has excellent qualifications for his new post. Those who know him well are familiar with his hardheaded economic philosophy, so frequently expounded by him to young men in the engineering colleges and so excellently set forth in the report of the Finance Committee, pages 44–47 of this issue. Persons who remind us that the rainy day will surely come are always good antidotes for overoptimism and overenthusiasm. We sometimes resent the cold water they appear to throw on our extravagant schemes for the future. But they serve us well, particularly when their eyes are cocked constantly on our finances. Many a family has been ruined by forgetting the maxim, it isn't the first cost but the upkeep. Societies, too, take on innocent-looking projects which obligate them to a continuing cost, year after year, and that are easier to pick up than to drop. Persons who face such matters realistically, as Jappe does, make us think twice before committing ourselves to what may be a future headache. A long-range sense of cautiousness does not make Jappe a heartless, penny-pinching Scrooge. On the contrary it affords him the luxury of maximum returns in which the Society as a whole will be the greatest beneficiary.

Associated with Mr. Jappe will be Jos. L. Kopf, who has been elected to the new office of assistant treasurer. Mr. Kopf served seven years on the Finance Committee during Dr. Ennis' treasurership and shares the philosophy of realism which the committee has developed. Many members will remember his presentation of the report of the Finance Committee a few years ago when he cast the printed document aside and spoke with considerable emotion about the men and their works that the report represented but did not mention. The Society is indeed fortunate that it has able members willing to contribute their time and talents to its financial affairs.

Training for Management

TWO methods of training for management practiced by two of our large industrial concerns are described in papers to be found in this issue. Mr. Muir describes how the General Electric Company tackles the task within the ranks of upper management itself, and Mr. Cowing how the General Motors Corporation attempts to develop potential supervisory and managerial material that can be fed into upper management by means of promotion from one level to the next as experience develops talent.

The subject is an important one, and the A.S.M.E. Committee on Education and Training for the Industries is to be commended for directing attention to it. Managerial and administrative functions are becoming of increasing importance as the organization of society pro-

ceeds. No enterprise, whether private or public, can be conducted successfully and in the public interest without the delegation of authority and responsibility to persons who are to administer it. Quite apart from the value of the goods and services that flow from these enterprised is the effect which the conduct of the enterprise has on the public. Gone are the days when the public cannot be considered. Corporate enterprise, in its task of adjusting itself to social and economic conditions in a rapidly changing world of ideas and responsibilities, is learning such a lesson. With the controls and influences exerted by the Government, by stockholders, by employees, the managements of corporate enterprises require not only proficiency in the techniques necessary to perform their essential functions but also a sensitiveness to and an understanding of the obligations laid upon them as public servants whose acts and decisions have far-reaching social and economic effects. To learn the job thoroughly and to continue to develop wisely and broadly in a manner to justify the authoritiy and responsibility given them with advancement in their organizations are qualifications that must not be allowed to atrophy. That large corporations are experimenting in the development and improvement of management material is a heartening sign of the times.

The principle on which these corporations are proceeding in raising the quality of persons in upper management is even more important in public enterprises, such as the numerous agencies of the government. Modern living demands an increasing amount of governmental regulation and control. Experience teaches democracies what regulations and controls are desirable. It becomes necessary to delegate authority and responsibility for the administration of these regulations and controls to public servants. We have a right to expect a high degree of intelligence and skill in this administration. Last year the A.S.M.E. Management Division sponsored a session on the subject of management in government. It was shown that under different and sometimes more difficult conditions than those that obtain in industry, government agencies are making good use of the principles of management developed by private enterprises. It would be interesting to learn what steps are being taken to train administrators of public enterprises not only in the techniques of management but in the broader phases of administration and how the selection and development of men to fill these posts are being improved.

Valedictory

LESS than a month before his death, Thomas Midgley, Jr., delivered over the telephone from his home in Ohio to the Silver Anniversary Forum on the Future of Industrial Research, sponsored by the Standard Oil Development Company, an address which proved to be his last.

A considerable portion of the address had to do with the relation of industrial research to the patent system. Attacks on the American patent system are frequent and at times reach dangerous proportions. They arise in many quarters and are based on a variety of misconceptions. Too little credit is given by certain groups of attackers to the stimulating effect patent protection has on progress in industrial research and the developments that grow out of it. Even "industry" itself was slow to appreciate this fact, as Dr. Midgley points out in the following extract from his address:

> In the early history of modern industry there is little evidence that it either knew or appreciated the fact that the patent system was responsible for its birth. All it knew or cared about was that it had a steam engine to run machines with, that machines could be operated by men hired at low wages to make things that could be sold at a profit. Little did it care that the steam engine had been developed by James Watt because James Watt knew he could get a "patent monopoly" on the results and sell steam engines at a profit. Few of the early units of our "modern industry" gave heed to the fact that they could follow in the footsteps of James Watt and increase their profits by contributing to the inventive and developmental process.

Dr. Midgley then disclosed some of the "unco-ordinated thinking" on the subject of industrial research and the American patent system. There is that school of thought which proposed a holiday for research until the humanities should be able to catch up with it; the proposals to put all research under governmental direction; the misconception on the part of some persons wishing to tamper with the patent system that the Government is giving something away to an individual when it grants a seventeen-year monopoly in exchange for the inventor's making the invention public; decisions of the courts which seem to be based on failure to understand what invention is; and many false reports that patents are "suppressed."

As to the growth of industrial research, Dr. Midgley asserted that "there is no longer any reason why the smaller units of industry should not make full use of industrial research for their own advancement and welfare," and in suggesting ways in which such research might be carried on he called attention to the growing number of co-operative laboratories coming into existence.

Thoughtful also were his observations on who should perform research of the fundamental type—those extensions of knowledge which do not bear immediate fruit in the form of marketable products based on the new discoveries of science. In a majority of cases, he said, such work can be safely entrusted to the research staffs of colleges and universities for three reasons: (1) University staffs can bring a broader vision to bear on fundamental problems; (2) such problems are likely to be set aside in industrial laboratories when more urgent work develops; and (3) work of this character is valuable to educational staffs in educating future scientists.

There are other quotable passages in Dr. Midgley's address. He closed with the plea for the development of better public relations.

> Many of the difficulties that have been placed in the way of industrial research resulted from an ignorance on the part of the public and even of men in high places as to what it was all about. Ignorance breeds fear and fear motivates destruction. I am advocating that industrial research itself improve its public acceptance—not that industrial units merely advertise their own research departments.....
>
> The public should be told just what research is when used by industry and how it benefits mankind. Then, too, as little secrecy as possible should be placed around new fundamental knowledge. It must be recognized that, lacking any legal means of protecting its use, except secrecy, some secrecy is quite proper; but let it be as little as possible.

ENGINEERS OF TOMORROW

By ROBERT M. GATES, PRESIDENT, A.S.M.E., 1944

PRESIDENT, AIR PREHEATER CORPORATION, NEW YORK, N. Y.

IN the 1943 annual report of the Engineers' Council for Professional Development is included the long-accepted, 125-year-old definition of engineering: "The art of organizing and directing men, and of controlling the forces and materials of nature, for the benefit of the human race." "Three elements are involved," the report notes, "one deals with men, the second with forces and materials, the last is the ultimate purpose."

Sometimes it has seemed, in our preoccupation with the control of forces and materials, as if that objective were regarded as the sole concern of the engineer, without consideration of the task of organizing and directing men or of the social purpose and social effect of the controls that engineers achieve.

If any of us have been inclined to ignore two of these angles of our historic triangle of engineering responsibility, we must recognize now that the task ahead of us involves the whole triangle.

With all these angles in mind I want to discuss the education and re-education of engineers to meet the challenge of war dislocations, of postwar reconversion, and of the prospect of vastly extended engineering opportunity the world around—in short, the education of the engineers of tomorrow to whom we must pass on the torch. We expect them to build on the heritage we shall leave to them.

OUR LEADERSHIP IN ENGINEERING EDUCATION

Our profession includes many distinguished leaders and authorities in the field of engineering education, to whom we properly look for direction of the training of the coming generation of engineers. We take pride in the leadership of our engineering schools. Many members of the faculties are intimately associated with the activities of this Society. Through the Society for the Promotion of Engineering Education, through our own Committees on Relations With Colleges and Education and Training for the Industries, and through the joint Engineers' Council for Professional Development, the members of our Society, as of the other engineering societies, are brought into touch with this field of professional education. We are all interested in the changing and expanding demands for engineering education and want to give intelligent support and co-operation to the efforts being made to meet them. In the adaptation of that training to new conditions the future of our profession is truly at stake.

It is a challenge not only to our engineering schools, but also to our professional societies, to our industries, and to all of us as citizens—for the extent and the quality of educational opportunity offered can only reflect the degree of public interest and support. Leadership can serve us only as we give it active co-operation.

BROADER VIEWS OF ENGINEERS' RESPONSIBILITIES

When someone asked Socrates what should be the content of the education of youth, he replied: "That which when men they will do." Our profession covers a wide range of activities, opportunities, responsibilities. It has been called the handmaid of civilization. If that was ever an appropriate term it has become more and more appropriate, for our profession faces greater, broader responsibilities than ever in the making of the world of tomorrow. What engineers have to do, what engineering education should fit them to do, needs continually to be rethought and redefined.

During the past year I have had much correspondence and many talks with people interested in this problem. It has seemed to me that a consensus of engineers, educators, and industrial executives which underlies constructive thinking shows five general assumptions.

1 SPECIALIZATION WITHOUT ISOLATION

Engineers cannot be isolationists, in so far as the traditional branches of the profession are concerned. Even in the very broad and fundamental branch of engineering which our Society represents, few of us in practice can be mechanical engineers alone; we have to learn something of civil, electrical, chemical, and whatever other branches there may be, in order to do intelligently and competently all the jobs that are entrusted to us. Specialize as we will, divide and subdivide our profession as we may for convenience, get way out on the end of a twig of one of the limbs of the engineering tree, the tree is still there to hold together its branches—and most of us at one time or another have to climb around a good deal.

Surveys show that a very large percentage of engineering graduates do not follow the type of engineering in which they specialized at school. The fundamental techniques and disciplines they have acquired have been more important to them than their early specialized training. And many regret the time lost by reason of too narrow direction of their school experience.

Many engineers are called upon to assume major responsibilities in industrial management. In the years ahead we may expect that the management of industry will be recruited more rather than less from our profession. The application of engineering techniques, of the engineering mind, to a broad field of postwar problems, not only here in America but also in other countries, will surely be needed. With these prospects, a technical isolationism must not accompany the necessary specialization in engineering education.

2 CHARACTER AS WELL AS KNOWLEDGE

Engineers cannot carry their technical qualifications around as they would carry other tools in a tool-kit—as if a diploma were a set of tools to be appraised and used with little connection with the owner's personality. A diploma may represent only a certain number of hours during which a person has been exposed to instruction and his temporary acquisition of enough information out of his textbooks to "pass off" certain courses. Judicious employers don't hire diplomas, or assign responsibility on the basis of diplomas. They value formal education, if it has entered into the character of the person who has had it, giving him not only an understanding of fundamental facts and principles, but also mental discipline, a habit of straight thinking, and some initiative, resourcefulness, and creative imagination. Engineering is more than an application of formulas to mechanical problems.

Engineers must be both theoretically and practically minded; must be both imaginative and realistic, keeping, as it were, one eye on goals to be sought and the other on means to be used. They have to bridge the gap between theory and practice. They want also—as are needed in nearly every field of human activity—those qualities of character that enable a person to get along

Presidential Address presented by title at the Annual Dinner in connection with the Annual Meeting, New York, N. Y., Nov. 27–Dec. 1, 1944, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

with other persons in mutual understanding and co-operation.

The experience of many employers with engineering graduates has convinced them that those who have acquired healthful work habits, a clear reasoning power, and the habit of thoroughness, along with an understanding of basic principles, can readily acquire the specialized knowledge for the kinds of engineering jobs that may be assigned them. I would not minimize the importance of the best scientific information and acquaintance with specialized problems of modern industry; but I would emphasize the more fundamental importance of a foundation of character. For specialized knowledge, once made available by human research and experience, cannot apply *itself* to these problems; it must be applied with ingenuity, resourcefulness, and imagination, usually also with co-operative adaptability, by *persons* who have those qualities.

3 ACQUAINTANCE WITH THE WHOLE INDUSTRIAL PROCESS

Engineers have developed for industry an almost unlimited capacity to produce. Yet industry has found no adequate way to move the mass of actual production, much less potential production, economically and continuously to consumers. The operation of the tendency of supply and demand to maintain a balance in our economic activities has been depended upon—but we have applied engineering techniques tremendously to increasing the supply without realizing the extent of our collateral responsibility for applying them to the other side of the balance.

Not that engineers have failed to contribute to increasing the demand for the products of industry. It is our profession that has developed more economical sources of power and means of applying it, constantly improved designs of products and processes, and created new products and new industries. As the productivity of industry has been enormously increased and the cost of production progressively lowered, the market for industry's output has been greatly expanded.

Yet economies in production have not been matched by economies in distribution. Industry's capacity to produce has not been fully used because the relatively rigid cost of distribution has blocked the channel—limiting effective demand and so checking the flow of production. The productivity we create demands open channels of distribution. Surely engineering techniques need to be applied there. Our obligation to industry includes the whole process.

One of the distinguished leaders of our profession, President Wickenden of Case School of Applied Science, has eloquently predicted in his notable address to Canadian engineers, "The Second Mile:" "Engineers will find their way into every field where science needs to be practically applied, cost counted, returns predicted, and work organized systematically. They will be called upon to share the control of disease with physicians, the control of finance with bankers, the bearing of risks with underwriters, the organizing of distribution with merchants and purchasing agents, the supplying of food with packers and purveyors, the raising of food with farmers, and the operation of the home with housewives. In few of these new fields, if any, will engineers be self-sufficient; to be useful they must be teamworkers; and they must be prepared to deal with 'men and their ways,' no less than 'things and their forces.' "

4 ADJUSTMENTS IN HUMAN RELATIONS

We know that the very achievements of our profession in exploring and harnessing the forces of nature have not only brought great benefits to mankind, and opened up endless vistas of further technical progress, but also made great changes in human relations and thereby created grave economic and social and political problems. We have brought water, steam, and electric power, and countless applications of them, into human service; but we have left largely to others—to businessmen and to politicians—the responsibility for adjustment of the consequent changes in human relations.

Hasn't there been in that adjustment a need of adjusters with more understanding of the forces and materials being brought to bear on human relations, of their possibilities and limitations, of the conditions essential for most efficient use? In a society being so changed by engineering achievement—changed and confused by the changes—isn't there need that the informed, trained, and disciplined minds of engineers be directed to the social ends of their achievements?

Or does social responsibility rest only on other groups without that sure footing, analytical skill, and clear perspective which engineering training and experience cultivate—or ought to cultivate?

5 EXTENSION OF EDUCATIONAL OPPORTUNITY

In connection with the problem of readjustment of the men returning from war service who have engineering aptitudes and aspirations—where war experience, in many cases, has involved the use of engineering techniques—we see the need of adequate provision of suitable training, open to them according to their individual wants and capacities. It will be not only in our engineering schools, which are expecting to receive large numbers of returning servicemen, but also in other institutions which can offer technical education and in industries themselves, whose experience in training warworkers has been a successful educational adventure. In this extensive task, in which government, industry, schools, and communities have begun to co-operate, the best techniques of selection and placement and counseling should be used. Among these service men are many, very many, of the engineers of tomorrow, and our engineering societies and technical institutions should make every possible effort to see that the men who have engineering promise get opportunity for training fitted to their potential service.

Nor should we stop there many of us believe—with the service men alone. The movement for assuring wider opportunity for education beyond the secondary-school level has been accelerated during the past few years. Leaders in education, industry, and other fields have expressed themselves vigorously about it. Colleges have sought larger funds for scholarships and fellowships; industries have established them to develop men not only for research but also for other service; the government provisions for servicemen have aroused popular interest in the same direction. The extension of educational opportunity concerns us in engineering, for we want in our profession tomorrow no less than the best our population can furnish.

James Truslow Adams, in his new book, "The Frontiers of American Culture, refers to one phase of this movement: "It was Jefferson's idea regarding equality and education that society should not tax or spend to make a silk purse out of every sow's ear, but that it would pay society—leaving aside for the moment the rights of the individual—to train and develop talent and ability, wherever found, for the benefit of society. It is impossible to make a sweeping statement of any validity as to the comparative proportions of ability to be found among individuals in any one economic layer, and that is about the only kind of layer we have in America. It is unquestionable, however, that among the vast numbers of workers there is also a vast amount of latent ability and intelligence which, properly put to use, would not only increase the happiness and contentment of the individual but inure to the benefit of all of us in the Great Society. What troubles the workers, and should trouble the rest of us, is how to go about it."

PROPOSALS FOR REDIRECTION AND EXPANSION OF ENGINEERING EDUCATION

Such questions and such problems are being brought to our attention by leading members of our profession and by responsible persons outside engineering. We are in the midst of the

greatest transformation of all time in man's relation to the means of production. The war has sharpened our awareness of it. It is not strange that we have many plans and suggestions for the education of engineers and technicians for postwar service. May I note some proposals that have been made with reference to each of the five problems I have mentioned.

1 GENERAL ENGINEERING COURSES

In recognition of the interrelations of the various fields of engineering in actual engineering practice, extension of *general* engineering courses is proposed, wherever teachers are available who can conduct such courses with the proper balance between generalization and specialization and where a sufficient enrollment can be assured. The general course might continue through the first three years of a four-year course, giving all students a cross section of each of the several branches of engineering, with their relations to each other, their place in industry, and in our economic life, and their present and potential contributions to technological advance and human welfare. The fourth year would be devoted to specialization in the student's chosen branch—in which he would receive a degree.

It is argued, in support of this plan, that many industrial corporations, both large and small, would welcome graduates with such broad foundation and give them appropriate opportunities for growth and advancement.

It is suggested also that many highly specialized courses now being given could be reduced in degree of specialization, or relegated to the graduate field, to the advantage of students. The larger industrial companies have training courses related to their specific problems. For smaller companies it is unlikely that school specialization will meet specific needs so well as will experience on the job or graduate work undertaken where it can be adapted closely to the job.

There are advocates of a six-year engineering course, in which three years would be devoted to a general engineering foundation and three years to a special branch of engineering, with adequate attention all along the way to economics, English, and human relations.

These proposals may not be inconsistent with each other, for four-year and six-year courses would naturally be recognized by different degrees.

2 CLOSER LIAISON WITH INDUSTRY

There is an ancient educational principle to the effect that one learns only by the application of his own will and effort—that one may be encouraged and helped to learn by a teacher, but must do the learning himself. And much of the learning most useful to engineers must come from direct contact with industry itself—experience that gives new meaning to school courses.

Regardless of the number of his college credits, or even his "marks"—whatever feats of memory may have taken him through college examinations—the engineering graduate comes up against the practical questions: "What sort of person are you now?" and "What can you do?" If he has built into his character habits and attitudes that make him self-starting, resourceful, efficient, and dependable, and if his diploma represents something more than the minutes of a previous meeting—represents tools that are really a part of him, always ready for use—then he has before him in engineering the proverbial career open to talent.

But that is more than teachers and textbooks can teach! Quite true. Yet it is what is now needed of more engineers than ever before, and will be needed of still more of them in the years ahead. Many of our recent graduates, and students who could not wait to be graduated, are now learning things they were never taught and developing qualities they never before displayed. This is in the discipline of the war emergencies that confront them, in the life-and-death struggle that calls out every ounce of effort they can put forth, in the realities of war that cannot be ignored or evaded. Can any like discipline be found in education for those who face no such emergencies or will have their training in piping times of peace?

At least we can introduce engineering students, as they go along, to the kind of realities they will encounter—invest their training with a purposefulness that only contact with reality can give. That is why more of our leaders in engineering education are advocating more extensive and systematic adoption of the plan of work on engineering jobs during the engineering course—some regular employment during a part of each year. Thus the importance and scope of what needs to be learned, of what qualities need to be acquired, are seen through experience—the best teacher. And the contact with fellow workers in such circumstances, the adjustment of individual habits and attitudes to the requirements of a working organization, would not be the least of the benefits.

It has been suggested also that members of the faculties of our engineering schools would do well to subject themselves frequently to similar experience—which would bring still more the atmosphere of reality and purposefulness into the halls of our engineering schools. Indeed is not such experience indispensable to the relationship that will assure proper training of the engineers of tomorrow?

To effect a closer liaison between engineering schools and industries their graduates may be expected to serve is as much a responsibility of industrial management as of college administrations or faculties. Industry should offer opportunities for both students and teachers to acquire the kind of experience I have mentioned. It might well also offer to provide experienced men as lecturers to engineering students—not with a view to expounding the merits or promoting the interests of a particular industry or product, but to make clear what sort of educational background, what qualities of personality, what adaptations to current conditions industry requires. They can help students to evaluate their own abilities, to become aware of their own needs, in the view of what industry wants, and with regard to the requirements of different industries. There are in industry many engineers of competence and experience who might properly round out their careers, as younger men take over some of their burden in industry, in service as counselors, and lecturers to engineering students.

In one way and another such relationships need to be cultivated more definitely and intensively, many of us believe. It has been done to such an extent that we are sure it can be done still more widely and more effectively.

3 BROADENING THE HORIZON TO MATCH WIDER OPPORTUNITIES

The processes and requirements of industry as a whole would in this way also come to be better understood. That understanding should be a part of the equipment of the engineers our schools send out. I have mentioned it previously as a requirement that is receiving increasing attention. Engineering techniques, we are told, need to be applied all along the line—not only in designing and production, but also in distribution. If, as a recent study of distribution has suggested, the services of many thousand engineers are going to be wanted in the distribution field, then the curricula of our engineering schools should make provision for training men for such potential jobs. Certainly the possibilities of using engineering techniques throughout the processes of industry should be carefully explored.

This is but another phase of the increasing tendency to broaden the field of engineering to match the broader opportunities that will face the engineers of tomorrow. Not only here in America, but in other countries, will there be an increased demand for American engineers with a thorough understanding of the processes of modern industry—with the know-how to create as well as extend industries. The aspiration and capacity for industrial development that we once thought an exclusive possession of certain peoples of Western Europe and North America have spilled over into other lands. Their

people look to us for guidance—especially to American engineers. It is a responsibility that we should meet.

4 SOCIAL RESPONSIBILITY OF ENGINEERS

As I have stated, there is a consensus of many engineers, looking back upon their own experience and looking out upon the problems our technical achievements have created, that we must give more attention in engineering education to the social and human consequences of technical progress in industry. If the last general item in our charter is to be recognized, and we are to consider "the benefit of the human race," then that thread of social responsibility must run through the fabric of our education.

The late Clarence F. Hirshfeld, first chairman of the Engineers' Council for Professional Development, said prophetically a few years ago: "The world is becoming conscious of the social and economic significance of engineering as never before. It is already demanding a greater responsibility on the part of the engineer for the changes that his works have brought about; and, in very plain language, it finds a dearth of engineers trained and experienced to carry the responsibility."

It means understanding of the world we live in, of the impact of social, political, and economic forces on human welfare, of the possibilities of reconciling competition and co-operation, of the balance of interests in which men and nations can get along together in peace and progress. The engineer should be sensitive to human values, and sympathetic with the aspiration of all human beings to live freely, productively, with a reasonable degree of security and a fair opportunity for advancement.

That understanding, that attitude, that sense of responsibility can not all be *taught*. It can be acquired, however, through courses that broaden vision, through reading that exposes and illuminates current economic and social problems, through the influence of teachers who have social perspective, and through contact in workaday jobs with the workaday world.

A century ago a famous French philosopher[1] noted: "If we have been accustomed to deplore the spectacle, among the artisan class, of a workman occupied during his whole life in nothing but making knife handles or pinheads, we may find something quite as lamentable in the intellectual class, in the exclusive employment of the human brain in resolving equations or classifying insects. The moral effect is unhappily analogous in both cases. It occasions a miserable indifference about the general course of human affairs as long as there are equations to resolve or pins to manufacture."

5 OPENING EDUCATIONAL DOORS

In the spreading of opportunity, not least educational opportunity, we see the safeguard of our freedom. As every career becomes really "open to talent," many of the tensions that threaten our democratic society will be relaxed, in the opinion of an increasing number of thoughtful persons.

In a report prepared by Dean Frank C. Hockema of Purdue University for the Carnegie Corporation in 1941 it was noted that "fewer than 40 per cent of the students admitted to engineering colleges complete the prescribed courses leading to a degree. The majority of the other 60 per cent fail as a result of poor teaching, unsuitable curriculum organization, and improper methods of organization. Only about 10 per cent drop out from other causes, such as ill health, financial difficulties, etc. . . . Yet a few institutions are able, by means of careful selection, guidance, and counseling, to graduate within the prescribed time approximately 80 per cent of the students admitted."

Is it not possible to reduce largely this waste of educational facilities? It is no credit to an educational institution or an instructor to count upon failing 15 to 25 per cent of an entering class the first year. Sometimes we have heard of that as a normal expectation. Something is wrong there with the process of selection, the type of instruction, or the provision for guidance—or all of them. A manufacturer who allowed, year after year, unnecessary waste of the material that was to be processed in his plant would have a hard time explaining his operations to his stockholders. This human material taken into our schools is surely more valuable.

If opportunity for intelligent selection is limited, as in some state-supported institutions, there is the greater need for individual guidance, to make sure that potential talent is not wasted and the door of opportunity is kept open. The entering classes in our engineering schools are made up mostly of young people who have had no vocational experience, or very little, and whose potential capacities may be developed at varying rates and by different methods. The experience of the schools which have given most attention to this problem ought to be widely circulated.

Furthermore we all know that much potential engineering talent is wasted because it is never given opportunity for development by an engineering course. Ways and means must be canvassed to provide such opportunity for the best fitted young people regardless of financial status. That is certainly a fundamental problem in relation to the engineers of tomorrow. Industry is giving aid in this matter—and should give more.

And in industry itself, as young engineering graduates are employed, the employers have an important educational obligation. They know that the educational process cannot be completed in any engineering school—that schools can furnish only a foundation to build on. Management implies leadership. Both senior and junior executives show successful leadership in proportion to the help they give those whom they are appointed to lead—help to grow, help in self-development. Their enlightened self-interest, as well as their social responsibility, calls for intelligent and systematic attention to the continued education and personal guidance of the young graduates they employ.

* * * * *

The future is hidden from all of us. We cannot divine it, as has been said, "by assuming that the trends observable at the moment in society will be carried through to their logical conclusion. Few trends ever reach their consummation, especially in the democratic state, with its changeable tides of public opinion and its tradition of compromise and adjustment."

As a prominent industrialist remarked recently, "Trees do not grow to the sky; we don't know why, but they don't. Any schoolboy can compute the rate of propagation of a pair of houseflies, and prove that in a couple of years their progeny will equal the whole mass of the earth. But that doesn't happen either." One can fearfully foresee in present trends the gradual development of the totalitarian socialist state—in our own as well as in other countries of the western world. But by the same token one might foresee in Soviet Russia a return to private capitalism and private enterprise. All we can be sure of is that change is going on, in various directions, and that the world of tomorrow will not be the same as the world of today. Indeed we engineers are making it different and will continue to bring about social change. Let us do our part in guiding it.

Every year, month, day, and hour marks a transition in the lives of individuals and nations. There is no halting of change—for better or worse. Americans have built up a standard of living higher, at least on the material side, than that of any other people in the history of the world. We have become accustomed to it, have been taught to expect it, and have cherished the promise that it shall be shared by all our people. We engineers have pointed to new horizons of opportunity for America. All of us have a collective responsibility, which is the sum of individual responsibilities, that this promise be fulfilled—in order that the builders may go on building.

President Bowman of Johns Hopkins, in an address some

(*Continued on page 69*)

[1] **August Comte**, quoted in Louis Mumford's "The Condition of Man."

POSTWAR EMPLOYMENT *of* VETERANS

By BRIGADIER GENERAL WILLIAM C. ROSE

CHIEF, EXECUTIVE SERVICES, WAR MANPOWER COMMISSION, WASHINGTON, D. C.

THOSE of us who are in the War Manpower Commission regard the reabsorption of veterans into our domestic economy as the first step in the long unwinding process from war. It is not and should not be regarded as more than a first step, for coupled with it is an even more difficult and important task, namely, that of providing for an adequate employment for all who need it.

I repeat, the employment of veterans cannot be divorced from that of others now in the labor market who wish to continue therein. It is true that our veterans have been set apart by their wartime service in uniform, and that various and sundry laws give them rights because of their service. This is right and proper. Without the contribution they have made to preserving the integrity of the nation, neither we nor they would have any rights or privileges to give!

It is also right and proper that a sense of obligation of a grateful people insists that veterans' placement be given priority, and to my way of thinking this is fortunate. A program which meets their requirements may well serve as the national pattern.

GOVERNMENT'S RESPONSIBILITY TO RETURNING VETERANS

In so far as Government is concerned, the Congress in the National Selective Service Act stated as a national policy that the returning, honorably discharged veteran is entitled to his old job or one equally good—circumstances of his former employer permitting. Many feel that this law does not go far enough, and already great segments of both industry and labor have gone further and are according, or propose to accord, preferential treatment to veterans far beyond the law to which I referred.

My purpose in this paper is to explain what the Government has done and is doing to expedite the re-employment of veterans now and in the postwar period.

First let us consider the responsibility of the armed services. Upon discharge, the service man becomes a civilian in one of three general classifications:

(*a*) Physically and mentally ready for employment.

(*b*) Requiring vocational or other training to fit him for suitable employment.

(*c*) His physical or mental condition makes immediate employment undesirable, and he must pass to the Veterans' Administration, the next federal agency in our chronology, for rehabilitation.

The Army, the Navy, the Marine Corps, and the Coast Guard then are involved until the man's services are no longer required in the armed forces; or if undergoing hospitalization, until his condition can no longer be improved through service medical facilities, then as just stated, he becomes the responsibility of the Veterans' Administration.

I cannot speak for the Veterans' Administration, but I can say that it is interested primarily in restoring the veteran to the condition where he can be gainfully employed; it enters the employment field only as an incident to its vocational rehabilitation activities.

U. S. EMPLOYMENT SERVICE, THE AGENCY FOR RE-EMPLOYMENT

The Selective Service System, and the U. S. Employment Service of the War Manpower Commission share the placement responsibility, and their spheres of operation were very clearly set forth several months ago in a joint agreement between the chairman of the War Manpower Commission and the director of Selective Service. This agreement makes the director of Selective Service responsible for the placing of the veteran in his old job, or one equally good as mentioned earlier. All other placement responsibilities lie with the War Manpower Commission which discharges this obligation through the facilities of its more than 1500 offices of the U. S. Employment Service.

Within the U. S. Employment Service there is established by law a major division, called the Veterans' Employment Service, a service brought into being by the Wagner-Peyser Act as far back as 1933, to insure that veterans of all wars were given specialized placement consideration. So that there would be no two government agencies competing in the same field, it was integrated into the nation-wide operations of the U. S. Employment Service, thus placing the total facilities of the older organization at the service of veterans in every section of the country. A veterans' employment representative was placed in each state and in each local employment office to insure that this particular duty was discharged.

The efficiency with which veterans' placement work has been carried on can be attributed largely to the two basic principles upon which the service is built. The first is that in the long run the employment interests of veterans may best be served through the medium of regular public employment offices where they like all others may be referred to employment on the basis of their abilities and qualifications. The second fundamental is the realization that veterans are a special group with problems of education, experience, and age which are more or less peculiar to themselves. To place this group intelligently requires insight and careful exploration into each individual's potentialities for work; in short, a highly personalized placement technique.

Planning for veterans of this war then requires but an analysis of the job as it exists today, what it will be in the future, and the expanding of our present setup to meet our part of these requirements.

VOLUME OF PLACEMENTS MOUNTING RAPIDLY

The mounting significance of our employment service to veterans of this war is readily evident from the fact that, for the fiscal year which ended June 30, 1942, there were 206,856 veteran placements, whereas for the next fiscal year the number increased by some 25 per cent. During the first 8 months of the current calendar year, these placements were 482,391, of which 65 per cent were veterans of the present conflict.

The steady increase in placements is readily understandable since more than 2000 men per day are now being discharged from the armed forces, and so long as we have an over-all strength of some 11,000,000 men, this number will not decrease.

Contributed by the Management Division and presented at the Annual Meeting, New York, N. Y., Nov. 27–Dec. 1, 1944, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

Rather, as battle casualties mount, and as the fruits of victory permit us to make substantial curtailments of the armed forces, tremendous additional numbers of ex-service men will re-enter the labor market. All of which leads me to emphasize what I implied earlier—that the problem is even now with us!

In January, 1943, the Veterans' Employment Service, feeling the need for more immediate contact with the veteran, opened an employment interviewing service in Navy hospitals. Later, in June, this service was extended to the Army, and today a veterans' employment representative is stationed in practically all service hospitals.

EMPLOYMENT COUNSELOR AT SERVICE HOSPITALS

The counselor talks to the man about to be discharged for physical disability, service-connected or otherwise. His rights to his old job are explained. Job problems are thoroughly discussed. The veteran is encouraged to talk about what he would like to do and, of course, what he can do. His rights to training are carefully explained. If his disability is service-connected, he can get the training he needs for the job he wants through the Veterans' Administration or, if there is no service connection, through the Office of Vocational Rehabilitation of the Federal Security Agency. Before he ever leaves, he gets the whole picture.

If the veteran does not need or want training, the matter of an immediate job is the next important consideration. If he wishes to return to his old employer he is referred to the Selective Service System. If he wants a new job, the veterans' employment representative can frequently arrange to place him without further formality.

If the job he wants is not available on the spot, the man goes back home (he can go in any case if he so desires) with an introduction to the U.S.E.S. office and veterans' placement representative in his own home town. A card telling his story also goes to that office, and upon the arrival of the veteran, his path is clear.

This service has been amazingly successful. In addition to its efficiency in finding the veteran a job, it has the added benefit of giving him a "lift;" a real welcome home in the practical sense. That contact with the veteran's employment representative tells him he is not being turned adrift to shift for himself, friendless and alone. He knows that a grateful country is interested in him and in his welfare.

So much for the specialized handling of men returning to civilian life from hospitals. What of those who are discharged without hospitalization? Our plan insures that they too receive preferential treatment.

TECHNIQUE DEVELOPED FOR PLACING VETERANS

I have already pointed out the long experience of the U. S. Employment Service with veterans of the first world war. I have also mentioned that the placement of veterans of the present war is becoming increasingly predominant in the overall total. In anticipation of this situation we asked ourselves: Are present procedures adequate to the special needs of this war's veterans? To get the answer to this question, last January we established demonstration centers in selected localities of the country, in which were thoroughly tested the best possible techniques for handling veterans. These centers were so organized as to provide the following:

1 Job counseling for the returning veteran in his home community.

2 Co-ordination in that community of the services of various agencies and groups who are interested in veterans' problems.

3 The field experience necessary to extend to all local U. S. Employment Service offices in the immediate future the latest and most effective techniques in the counseling and placing of veterans.

In the operation of these centers, I need hardly add that the major emphasis was placed on realistic job counseling with a view to securing long-term job placements. Our activities were of course co-ordinated with the counseling service performed at military and naval discharge centers.

The techniques developed in these experimental headquarters have now been introduced into every one of our 1500 permanent U. S. Employment Service offices. In the main, the procedures heretofore used were found to be sound and are the basis of present and future operations. The demonstration offices did, however, clearly show the value of bringing the community closer to the local office. To meet this need, an advisory committee, made up of outstanding citizens who represented all phases of life in the community, was established in each locality.

In addition, the field of job counseling was greatly expanded. Special counselors for the handicapped were provided. The experience we have gained during the war in utilizing civilian handicapped is at his fingertips. The occupational breakdown of each job gives him exact information on its physical requirements and working conditions.

We are making this counseling service the best of its kind. For it we are using the best personnel we can secure. Whenever possible, they too are veterans.

I should emphasize one other aid to orderly and systematic placement of former members of the military service. In conjunction with the War and Navy Departments, the War Manpower Commission has developed "Special Aids for Placing Military and Naval Personnel in Civilian Jobs." These list the types of occupations found in the armed services and the related civilian jobs. Accompanying each is a detailed statement, or "job description," which outlines the skills required, the working conditions, physical demands, and the training (or supplemental training) necessary to fill the related jobs listed therein. I am not a sales agent for the Government Printing Office, but those who are interested can secure copies.[1]

Finally, we take into consideration the fact that the job the veteran gets first may be the wrong one. After a week or two he may find he has made a mistake. If so, we have agreed that he has the right to "shop around" a bit if it seems desirable. The stabilization program, statements of availability, etc., do not apply to him. He may have as long as he needs. The veterans' placement officers are instructed to be generous with time when a veteran is concerned.

POSTWAR OBJECTIVES

Earlier I stated my belief that the pattern established for the re-employment of veterans would point the way toward an over-all postwar employment program. I feel that I should also outline the objectives which in our thinking must be included in any reasonable solution.

What are they? When the war ends, we shall be faced with a multitude of new and intensely difficult problems. Our postwar economy must be set on a firm basis. The demand for capacity production—and by the same token full employment—will be heard from every side. The question then is: How can it be achieved?

During the last few years we have learned much of the nation's resources and how they could be harnessed to the common task. In the production of implements of war, we set our sights and achieved our goals with a speed and efficiency which surprised even ourselves and stunned our enemies! Only by the most careful planning and co-ordination was this miracle accomplished. Only by the same kind of planning and co-ordination can we achieve the peacetime equivalent.

With the same will and determination, the same courage and imagination, the same foresight and teamwork, we can create an economy of abundance that will outstrip any prosperity we have ever known. We can and therefore we must provide

[1] Superintendent of Documents, Government Printing Office, Washington, D. C. The Naval supplement of the "Aids" costs 30 cents; the original Army section, $1.

for every woman and man who wishes to work a full-time job at a fair wage. We can and must guarantee to every farmer a steady, consistent, and profitable return on his crops; we can and must assure full scope to honest private initiative with full opportunity for fair and reasonable profit.

That is the goal to strive for, and we in the War Manpower Commission maintain that it is an entirely rational and possible goal. To achieve it we must have an orderly demobilization of our workers in war industries. To achieve it we must have an orderly reconversion of our war plants to civilian production. A failure in any one of these will mean the failure of all.

This mobilization for peace will not be easy. It will be even more difficult than our mobilization for war. It is nonsense to assume that it will come about of its own accord. It must proceed with the same over-all strategy which marks the direction of a major military campaign. It is not a job for Government alone. It is not a job for management alone; and certainly it is not a job for labor alone. The total energies of every group in the nation must continue to unite for the common welfare with the same disregard for selfish ends which characterized the war effort.

MODIFICATION OF CONTROL PROGRAMS PLANNED

We in the War Manpower Commission are prepared to do our part. Upon the surrender of Germany, the War Manpower Commission will pass from a regulatory body to a service organization. The first step will be the removal or modification of the following control programs as rapidly as the changing situation permits:

(*a*) The 48-hour work week.
(*b*) Our employment stabilization programs.
(*c*) The priority referral of male workers.
(*d*) Employment ceilings.

I am sure it is needless for me to emphasize that, until Japan is defeated, manpower requirements for war production must continue to have priority over all others. To the degree necessary to meet this obligation these controls will of course continue.

As the manpower controls of war diminish or are withdrawn, they will be balanced by an increasing emphasis on the following nonregulatory functions:

1 Full use of the national network of approximately 1500 local employment offices, supplemented by over 2000 itinerant points, to provide the widest possible coverage throughout the country for referring displaced workers and veterans to available employment.

2 Labor market reports and occupational information on labor supply and demand, employer requirements for additional workers, anticipated layoffs, etc., for the use of local offices in referring workers and veterans to where they are needed, and for the use of procurement authorities in the placement and redistribution of contracts.

3 A nation-wide system of job clearance whereby local employment offices are kept aware of job openings in other parts of the country and through which means we can arrange for the voluntary transfer of workers from labor surplus areas to areas of job opportunity.

4 The exercise of "priority in service," based upon procurement-agency determinations as to high-priority plants, in order that urgent plants needing labor can receive preferential attention.

5 The exercise of "priority referral" designed to "sell" high-priority jobs to the several million workers who will be released.

6 The continued application of priority ratings to interregional clearance orders, so that war jobs can be offered first to workers voluntarily transferring.

7 The continued functioning of area management-labor committees who can formulate necessary manpower programs for overcoming urgent manpower problems in the community on a voluntary basis.

8 The registration with and periodic reporting to United States Employment Service offices, as required by State unemployment-insurance laws, of workers seeking unemployment benefits.

9 The offering of suitable employment to workers as required by state law.

10 For workers who are difficult to place in war or civilian production, and for all veterans who are discharged from the armed forces, an expanded counseling service which is designed to make use of the skills, experience, and the aptitudes of such workers.

PRESENT MANPOWER SITUATION

Before concluding I would like to mention briefly the national manpower situation which exists today. In our concentration upon postwar problems, we cannot afford to lose sight of the fact that the war is not yet won; that there will continue to be months of bitter fighting in Europe, and that after the German phase is disposed of we shall still be engaged in combat with a grim, relentless, and merciless foe who must not be underestimated.

I know that as a result of decreases in certain types of production, there is a popular impression that war production as a whole has passed its peak; actually, critical manpower shortages in many lines are still worrying us. Here is a report! Some manpower shortages at this very moment are holding up vital war production. I think you will find the following facts rather sobering:

Readers realize, of course, the part rockets now are playing in the war. These devastating weapons may hold the key to victory. How is our rocket production going? I was told by our operations people that both the urgent rocket and supercritical heavy-artillery-ammunition programs are threatened by lags in production of explosives and in the operations of ammunition-loading plants; lags due in part to shortages in manpower.

Critical labor shortages exist also in foundries and in logging operations. Sharp rises in production requirements for other types of war equipment are faced. Radar and signal-equipment requirements are straining facilities and manpower to the utmost. Efforts to expedite the output of ships maintain labor needs at an almost impossible level. The output of tanks must be stepped up; several plants in tight labor areas must have more workers.

Greatly increased cotton-duck and tent-twill requirements are most urgently related both to the winter campaign in Europe and General MacArthur's tropical operations. Battle-front demands for heavy artillery and carriages, greatly in excess of plant capacity, call for immediate filling of relatively small labor needs. We have overcome manpower shortages in the heavy-duty-tire and aviation-gasoline industries but new labor requirements for the production of even higher-octane fuel are faced.

That's our present manpower headache at a glance.

The nearer we get to victory, the more vital will become our needs. In all theaters of operation, particularly in France, in Germany, and in the Philippines, we are now in the midst of our greatest endeavor. Every time one of us quits, or fails to seek other essential employment when production adjustments occur, we push the day of victory just that much farther off.

I emphasize these facts because I feel that because of the importance of contacts of my readers with both industry and labor, they can carry this "message to Garcia."

Peacetime "jitters" are premature. Until we have won the war, until the day of final victory is here, the challenge of the peace cannot be met, and let no one of us think otherwise.

Problem of Returning SERVICE MAN *From* LABOR VIEWPOINT

By CLINTON S. GOLDEN

ASSISTANT TO PRESIDENT, UNITED STEELWORKERS OF AMERICA

THERE exists the problem of the returning service man securing employment in a decent job just to the extent that there are jobs enough for all able and willing to work.

Efforts have been made to create the impression, for some reason I have never been able to comprehend, that organized labor is more concerned about protecting the jobs of workers who have remained in the civilian labor force than in seeing that the returning service man has a job upon his honorable discharge from the armed services of our country.

Nothing can be farther from the truth and the ascertainable facts as to the position of organized labor.

In the first place the people in the labor movement are actively conscious of a deep debt of gratitude to all those in the armed forces. We know if it were not for their heroic efforts and unselfish devotion to our country and its institutions of liberty and freedom, we could not be as confident of victory as we are today.

If for any reason we should be the vanquished rather than the victors in this global struggle, members of organized labor well know that their unions would be the first of the institutions of freedom and democracy to be destroyed.

Anyone who has followed the emergence and development of totalitarianism in other countries has observed that the first institutions to be attacked and then destroyed by the dictators have been the free labor organizations. The reason is simple and understandable. Unions are organisms created by the people—the producers. They can only grow and flourish where liberty and freedom exist and flourish.

ORGANIZED LABOR DESIRES RE-EMPLOYMENT OF SERVICE MEN

The organized-labor movement then desires that every person who is in the armed services is assured of a job as soon as he returns to civilian life. This desire is reflected in statements of policy issued by the powerful national labor federations, the C.I.O., and the A.F. of L., as well as the great unaffiliated railroad brotherhoods.

It is reflected in agreements reached between unions and employers, as in the case of all the railroad unions and the representatives of the carriers even before the passage of the Selective Service Act.

People occupying, in some instances, responsible governmental positions have created the impression that the Selective Service Administration has the sole concern and responsibility for seeing that the veteran gets a job and, by a process of tortuous reasoning, undertake to imply that unions at least are concerned with curtailing the veterans' rights and ignoring the requirements of the Selective Service Act.

Publications and writers known for their hostility toward labor organizations have evidently undertaken to drive a wedge between the returning service men and the organized workers. Considering the past record of these publications and writers, it would appear that they hope to use the veterans to destroy the labor organizations.

At a time when there is the greatest degree of good will toward the men in the armed services on the part of nearly all our citizens, a certain few, for reasons best known to themselves, are sowing the seeds of distrust and suspicion and seeking to create disunity.

UNION MEN IN ARMED FORCES

There are probably not less than 2,000,000 members of organized labor in the armed services. Two C.I.O. unions alone have more than 500,000; they are the United Automobile Workers with 325,000 members and the United Steelworkers with 201,600 in uniform. In the case of the newer unions, many of these are the very men that helped create and build the unions. Is it reasonable to suppose that their fellow union members, who for whatever reason are not in the armed forces, want to prevent these men from getting their old jobs back?

Even before the Selective Service Act was passed by Congress many unions were negotiating agreements with employers providing for safeguarding the jobs of men entering the armed services.

It was organized labor that urged the inclusion of re-employment provisions in the Selective Service Act. The organized-labor movement has supported every bit of legislation directed toward improving the status of the service man and assisting him in his efforts to establish himself in a useful, remunerative occupation upon his discharge. Examples of this are the support given by all organized labor to the G.I. Bill of Rights, the right of soldiers to vote, and the bill to increase G.I. pay and allowances.

All unions have beeen asked by the heads of the federations with which they are affiliated to waive the payment of initiation fees on the part of returning service men. Many unions including my own, the United Steelworkers, have taken steps to see that the member entering the armed service is maintained in good-standing membership without the payment of dues or assessments of any kind.

The concern of the members of unions for the returning service men is exhibited, dramatized, and implemented in many other practical ways.

PRACTICAL RE-EMPLOYMENT AIDS PROVIDED BY UNIONS

The Selective Service Act requires that, in order to get his former job back again or one substantially equivalent to it, the returning service man must apply for it within 40 days after his honorable discharge. Many union agreements and notably those between the United Auto Workers, and Ford, and General Motors extend that period to 90 days.

Other union agreements in the automotive industry permit an employee entering the armed services prior to completion of his period of probationary employment, one in which he acquires no seniority until its completion and then only upon attainment of the status of a regular employee, to acquire permanent status and seniority standing by crediting his military service toward completion of his probationary employment.

It should also be pointed out that these union agreement safeguards, erected to aid the returning service men, apply to all

Contributed by the Management Division and presented at the Annual Meeting, New York, N. Y., Nov. 27–Dec. 1, 1944, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

who left industry to join the armed services or the merchant marine and regardless of whether at the time they were members or nonmembers of the union certified as the bargaining agency. The Selective Service Act covers only a fraction of this number.

Again in many instances unions have waived their own seniority rules to permit disabled veterans to have jobs more suitable to their physical condition than the ones which they left and to which they had re-employment rights.

In July, 1944, committees representing both the American Federation of Labor and the Congress of Industrial Organizations met with a committee representing the Veterans of Foreign Wars and developed an agreement of great significance. This agreement which was built upon the sound premise that "the welfare of the nation's veterans is ultimately dependent upon the well-being of the whole country" proceeded to outline policy on three major points, as follows:

THREE MAJOR POINTS

1 The right of occupationally qualified veterans to join contract-holding unions in closed or union shops, as well as elsewhere, at pre-1940 initiation fees and with dues at the same rate as those paid by present members doing the same work. This means that a veteran will be entitled to full union membership regardless of how or where he learned his trade and will be given preferential treatment in the matter of initiation fees and guaranteed against discriminatory treatment in regard to dues.

The foregoing has particular application and significance to veterans who have acquired skills that are identified with craft, rather than industrial unions. It should be borne in mind that the membership of craft unions is based largely upon the skills of certain trades such as carpenters, painters, bricklayers, patternmakers, etc. The craft union endeavors to perpetuate these skills by adherence to high standards of workmanship and careful apprentice training. Its bargaining position is determined largely by the extent those possessing the skill are organized and able to maintain the standards of workmanship required by the craft or trade. The provision does not have the same significance in relation to unions organized on the industrial basis, which as a rule have but nominal initiation fees and monthly dues.

2 Provision for extending seniority credit to veterans on a month-to-month basis, for the time engaged in military service after September 1, 1940, and regardless of whether they left "probationary" or regular jobs, or even where they had never had a job prior to entering the armed services.

3 Provision was made in the case of disabled veterans who are physically unable to perform the duties incident to their old jobs to have seniority rules waived so that the disabled veteran could take any job that his condition would permit.

Many other illustrations of the concern of union members for the return to full and useful employment of all veterans could be cited that would be sufficient to convince any fair-minded person of the falsity of the charges and accusations hurled by enemies of the labor movement.

An impression has been created that the effective administration of the Selective Service Act will provide jobs for the returning service men. Upon calm analysis any fair-minded person will find that this is just not the case. In fact Colonel Paul Griffith of General Hershey's staff stated at a meeting under the auspices of the National Industrial Conference Board on August 17, 1944, that only about 20 per cent of the 11 or 12 million men who return from military service can be placed in permanent jobs by the provisions of the Selective Service Act.

"JOBS FOR ALL"

Instead of creating animosity and ill will, seeking to set veterans against nonveterans to accomplish the selfish purposes of certain politicians, all efforts should instead be directed toward insuring enough jobs for all.

To be sure there will be problems of adjustment that will require wise and skillful leadership on the part of management, labor, Selective Service and other governmental agencies. If there are less than enough jobs for all, sacrifices will be called for.

In so far as the union members are concerned, I am confident they will be prepared to make them. For, after all, the returning service men in large numbers are the sons, brothers, former shopmates, and neighbors of union members who went off to wage war for the preservation of human values, dignity, and freedom for all of us. Working people by and large are unselfish and grateful.

Workers resent arbitrary and unfair dictums. They resent for instance the unqualified dictum that a worker must be discharged if necessary to make possible the return of a service man to his job. Without qualification this can mean the discharge of another service man or a veteran of the first world war. Or it may mean the discharge of the father of the very service man for whom a job is sought. Organized workers see in such a dictum a weapon that can be used by unscrupulous employers to destroy a union.

SENIORITY A FAIR BASIS FOR EMPLOYMENT

Painfully and tediously over a long period of time, seniority rules have been developed and incorporated in collective-bargaining agreements as a device to insure against favoritism and discrimination. They reflect a conviction that when a man devotes all or a part of his life to working for an employer he acquires, in proportion to his length of service with that employer, certain property rights and interest in a job that he cannot arbitrarily or capriciously be deprived of.

This is just as important to the veteran as to the nonveteran. These rules will operate long after the one-year period provided for in the Selective Service Act. They will not only protect him in his job but will safeguard his rights when opportunities are open for promotion.

Thus far more than a million men have been honorably discharged. Most of them have secured jobs. Many have returned to their former jobs without difficulty. Others have elected to seek employment in places other than where previously employed. More than 10,000 have already returned to employment in the steel industry.

When permitted by management to do so, union committeemen and representatives have worked wholeheartedly to aid in getting the veteran back to his former job or one of equal or better content or pay. Through the joint administration of the seniority rules, transfers and adjustments in the working forces have been effectuated where necessary on the basis of fairness in order to make room for the veteran. If not all the working force was needed, the last nonveterans hired were laid off. They were aided in securing employment elsewhere.

Present employment and war-production conditions have been favorable for employment opportunities. The test will come if there is a sudden end to the war. It is anticipation of such an eventuality that causes unions to be concerned with government conversion policies and the development of carefully thought-out plans for postwar production and employment.

The time is already here for the men of good will in the military forces, in Government, industry, and organized labor to join hands and see that not only are there employment opportunities for the returning service man but for all others who are willing and able to work. Only in this way can we be confident of winning the peace.

INDUSTRIAL JOBS *for Returning* VETERANS

By STEWART M. LOWRY

DIRECTOR OF INDUSTRIAL RELATIONS, THE PROCTOR & GAMBLE CO., CINCINNATI, OHIO

A POPULAR poll on the question of whether or not the men and women who return from the armed services are entitled to good jobs in civilian life would be so nearly unanimous, on the affirmative side, that it would be a waste of time to take such a poll. There is no question about how the American people *feel* on this subject. Many organizations, groups, and individuals are embracing it as one of their major current problems and are talking and writing a great deal about their own particular theories and plans for its solution. This widespread interest is a good sign. It is the right and proper public state of mind to stimulate the formulation of plans and the execution of those plans.

It is clear, however, that the time for planning is rapidly running out. Veterans are right now returning in ever-increasing numbers, and plans should be actually in operation. In many cases, they are. Some communities, and some companies, are doing a good job, although the country, as a whole, is far from being completely organized to handle the total problem smoothly, when it strikes in full force; when all hostilities cease, and when we are in the midst of complete reconversion. Nevertheless, we should be learning out of current experience, adjusting plans, where necessary, as we go along, but never being without a long-range plan, that reaches all the way into the coming peace.

THREE PHASES OF PLANNING

One might ask, "What should be the scope of our planning?" The Government is planning, communities are planning, companies are planning, unions are planning, veterans' organizations are planning. How does it all tie together toward the common objective of making sure that the veterans will all have good jobs? It must all fit into an over-all workable pattern.

To look at it broadly, there are three phases of the total job: (1) The national job; (2) the community job; (3) the employer's job.

The national job includes legislation and its interpretation; much of the rehabilitation of veterans who need it before discharge, insurance, loans, etc. The national job includes also a responsibility for co-ordinating the activities of local communities.

The community job is of vital importance in this total picture. The first place "G. I. Joe" will head for when he gets out of the service will be his old home town. Immediately, he is identified with a local community. And that is where the jobs are. That makes it sound almost too simple. Obviously, the number of veterans returning to a given community would not match up exactly with the number of available jobs in that same community, even if the community knew the number of available jobs and where they were, which it does not. Even if the numbers did match, there would still be quite a problem to bring job and man together, to their mutual satisfaction, in each individual case. That's why it takes more than a statistician to solve this problem. That's why the entire community should be conscious of its obligation and why it should be effectively organized properly to carry out that obligation. The burden of responsibility must be shared by all elements of the community. The responsibility should not—in fact, it cannot—be placed wholly on the manufacturing industries that happen to be located in the city, town, or county. Those industries should be expected to absorb no greater proportion of the gainfully employed than they have in the past. Country-wide, that proportion has been, in the past, about 25 per cent. The remainder have worked in offices, on the farms, in municipal, public, and government services, in the corner grocery, drug store, and service station.

In other words, jobs are going to be found about where they have always been found, except that we hope they will be everywhere in greater numbers. They *must* be in greater numbers if there is to be full employment. It is significant that more than a million small businesses were discontinued in 1943. That means that a very sizable potential of the total number of jobs necessary to a balanced peacetime economy simply does not exist at the present moment. Wishful thinking, loud talking, and statistical manipulation of important figures are not going to conjure them up out of thin air. Little businesses or others to replace them must be re-established. This all comes within the orbit of the community problem. It calls for good community organization to appraise accurately the job potentialities of small businesses.

It also goes back to the first phase, i.e., the national problem. The attitude of Government will be all important in determining how quickly these businesses will be re-established. Excessive government regulations, restrictive controls, voluminous reports, the attendant bookkeeping and expense, with the risk of loss too great, and the possibility of profit too small, will retard rather than encourage the little fellow to risk his small capital in a private venture that might provide work for one, two, or half a dozen men. There is a real community job to be done, and everyone in every community in the nation should realize that approximately 75 per cent of the necessary jobs to attain and maintain full employment must be found outside of strictly manufacturing industries. Industry's share of this responsibility is large—larger perhaps than any other individual segment of our business economy—but it should not loom in the popular conception as larger than it really is.

PLANNING BY INDUSTRIAL CONCERNS

Many of the larger companies have been quietly thinking about, and planning for, the returning veteran for a year or more and have worked out their policies and procedures in minute detail. I suspect that their aggregate accomplishment is much greater than the limited publicity on the subject would indicate. I do not mean to imply that these companies want more public credit for what they are doing. They are not doing it for that reason. They are doing it because they really want their people back—few, if any, will need external persuasion—and they are going ahead "sawing wood," working through the usual essential steps of policy and procedure. In effect, they have said, "This is important. We want to bring back our service men and women—in an orderly and systematic way,

Contributed by the Management Division and presented at the Annual Meeting, New York, N. Y., Nov. 27–Dec. 1, 1944, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

yes—but also in a way that insures that we live up not only to our legal obligations, but what is more important and more far-reaching, to our moral obligations."

Many of the smaller companies with limited organizations have not of course been able to carry through to the same degree of detail as the larger companies. Since two thirds or more of all our industrial workers are normally employed in plants with less than 500 workers, it is apparent that these smaller plants will be called upon to reabsorb the bulk of the service men who return to manufacturing industry. Whereas the larger plants are able to set up special departments to handle this work, in the smaller plants the burden will fall largely upon the members of top management. They, too, should have a program and be prepared to carry it through.

HOW A CAREFULLY DEVELOPED RE-EMPLOYMENT PLAN OPERATES

In discussing the company problem, I shall use as background the plan of The Proctor & Gamble Company. But I should like to make one point clear: It is not suggested as the answer to all questions involved in veteran re-employment. It is simply offered as an example, one plan which has been worked out to a fairly complete stage.

Let's get right down to cases—let's take your own plant. Assume you are the manager arriving at your office on a morning in the not too distant future. You barely get settled at your desk before your secretary announces that John Smith is in the waiting room, back home from the Army and ready to go back to work. Of course you'll see him and welcome him back, but the important thing is, what are you going to say to him? Remember, he has been thinking about this day and this interview for some time. Are you going to be prepared to follow up your greeting with an assurance that you, too, have been anticipating this day, that you are ready with the necessary plans that will put him back on his old job or another one just as good?

Or are you going to admit that he has caught you a little unprepared, particularly in view of recent contract cancellations and reconversion problems? You might suggest that he take a few more weeks to rest up and that you will have something worked out for him when he comes back. This probably would be quite a letdown for him and, at best, not a very good general formula when more and more John Smiths show up.

If we have done the right kind of planning, we shall be prepared for John Smith and he will not be disappointed. If we haven't, we shall flounder and we shall do only a makeshift job.

A number of companies have done an excellent job. In fact, it is my opinion that the larger companies have done relatively a better job than have the communities.

In our company, specific plans have been in the making for well over a year. The problem, as we saw it, broke down into three parts:

1 Maintain current contacts with men and women in service.

2 Establish tentative future organizations, showing probable assignment of each service man eligible to return, and the probable transfers of present employees.

3 Develop specific procedures for reinduction and retraining of the service man to get under way promptly when he reports for work.

Maintaining Current Contacts. Item 1 might be termed the preparatory phase of good personnel administration. The men and women who are away in the services can easily become strong and influential elements of our organizations after they come back. Let's stimulate a reasonable amount of healthy thinking about their company—thinking that the privilege of returning to a good job in a good company is one of the things they are fighting for. There is no better way to do this than to demonstrate that we are thinking about them.

We try to do this in the following ways:

(*a*) We have been sending our employees' magazine to each man and woman in the services ever since they left.

(*b*) We are sending them a monthly newsletter. It is mimeographed, informal, gossipy, local; each factory writes its own letter, with suggestions from the Industrial Relations Division. A personal message from their own factory superintendent is on the first page. It includes current company news items that might not reach them any other way; it includes excerpts of letters from men in service, and frequent reminders that we like to hear from them. It is distributed also to our civilian employees.

(*c*) We send them periodically a sample package of company products. It so happens that soap is one of the things most desired personally by service men and frequently very difficult to obtain. Otherwise, we would send them some other kind of merchandise.

(*d*) We send them a Christmas remembrance with a greeting. This year it will be a package of useful merchandise and food delicacies.

(*e*) We encourage employees to keep up personal correspondence with those in service.

Placing Service Men in Future Organization. We first had to determine how many people we expect to need for our postwar business. The Sales Department, guided by its Market Research group, has estimated how much soap, cooking fats, and other products we expect to sell in the immediate postwar period. We can find out quickly from our Industrial Engineering Department the man-hours necessary to manufacture each unit of our various products. Based upon these and similar data, we have translated the Sales Department estimates into exact personnel requirements for each factory.

We put this down in the form of an organization chart, carried out to the last detail, showing every division, department, and individual job, with the names of present employees where the jobs are now filled. Then we list the eligible men now in military service, placing each man's name opposite the job that he left. In placing these names in the tentative future organization, two basic principles are kept in mind:

1 Place the veteran on his former job, if possible. There may be reasons for not doing this. If so, they should be good and compelling reasons.

2 If his former job is not available for him, assign him to one that is equal to or better than his former job as to status and pay.

To carry out these principles in a particular case may involve the transfer or even the termination of a civilian employee. It is our opinion and hope that few, if any, of our civilian employees will be required to leave our employment to provide the necessary places for our returning veterans. It is felt that normal turnover, business expansion, the possible return to the normal 40-hr work week, the voluntary withdrawal of housewives, the aged, minors, and other "war-emergency" temporary employees, will, all together, provide the necessary places. To tide over short periods of adjustment, it may be necessary to create a "pool" of temporarily unassigned personnel to be drawn upon for special assignments, expanded or specially developed new activities.

If it is necessary to place the veteran on another job, reference is made to job evaluation and standard wage-rate schedules to make sure that the new classification is at least equal to that of the former job and correspondingly carries an equal or higher rate of pay.

When the first draft of the tentative organization has been completed, we have only started. For each job, we have assigned the name of the best qualified person available from the combined lists of eligible service men and those now on our pay roll. The chart becomes a work sheet, subject to immediate alterations due to changes in present organization, or positive information that a service man will not return or that his tentative assignments can be improved. Each such case is treated as

an individual problem within the structure of the general plan. By keeping these changes up-to-date, we shall not find ourselves in the position of not knowing, at a glance, what our current plans are for any given individual.

We realize that a number of variable factors exist, which are entirely beyond our control; to list a few:

1 Not all eligible men and women in the services will return.

2 Those who do return will not return in any predictable order or at any now predictable time.

3 Some will not be qualified, because of disability, for the jobs to which we are now assigning them.

4 Death, terminations, and other changes in organization will require continual shuffling of names on our work sheets.

Nevertheless, we are confident that we can meet these individual situations more intelligently because of our plan, than we could without it.

Obviously, the work on these organization charts should be handled on a confidential basis. Necessity for continual shifting of assignments makes it more than a clerical job and demands the personal time and attention of responsible executives.

Reintroduction and Retraining for Immediate Re-employment. Let us visualize again John Smith reporting for work at his factory. Through our various communications to him, he knows he is expected and welcome. The superintendent and the rest of the organization will not be caught unprepared because they already have given considerable thought to him as an individual and to his place in the organization.

We want the factory superintendent or division head to talk to each returning veteran—to welcome him in his own way—but mainly to assure him that we have definite plans concerning his re-employment. We are guessing that this man will be impatient to re-establish himself in civil life, and we want to satisfy this desire promptly. The amenities of greeting his friends and acquaintances will not require much time. A schedule should be set up that will keep him occupied and interested during his transition. He will need a period of reorientation and possibly of training. If he is returning to his former job, this will consist of little more than bringing him up-to-date on changes in method, equipment, or processes. If he is taking up a different kind of work, the training program will be somewhat more elaborate. In either case, it will be more or less tailor-made to fit his requirements and concentrated so that he can pick up the full responsibilities of his new job as quickly as possible. Training material has been developed for every key operating job. It will be right at hand when needed for a specific case. Supervisory and technical positions will require more individualized training programs, consistent with our normal procedure; but we have the basic information and experience to act quickly in these cases too.

FUNDAMENTALS OF RE-EMPLOYMENT PLAN

Our plan is fundamentally very simple. We feel that its greatest value comes from the sharp crystallization of the problem, which, in turn, demands more organized thinking than we might otherwise have given the subject.

Rather than to suggest the adoption of the specific procedure that I have described, I feel it is much more my function to urge the reader, if he has not yet done so, to get his own problem down on paper and follow through some kind of a plan. He might be surprised to find that it is a bigger problem than it seemed when he just had it in his head.

Now to sum up. If I were called upon to suggest a general guide in approaching this problem, I should put down the following four points:

1 Establish a policy. Write out and agree upon the company's position with respect to such items as:

Eligibility for reinstatement.
Time limit.
Qualifications to perform duties.
Physical examinations.
Establishment of seniority, status, and pay.
Place of re-employment.
Service credit in employee benefit plans.
Vacations.
Order of release of civilians, if necessary, to make places for veterans.
There are doubtless others.

2 Develop a procedure. This should reflect and interpret policy. It should be in the form of a written manual to be placed in the hands of all who are charged with specific responsibilities for carrying out the program. It might cover such phases of the problem as the following:

Organization charts.
Interviews with veteran.
Selection of job, considering physical examination and any disabilities.
Reorientation.
Placement.
Training (including retraining on former job).
Handling of veteran by supervision.
Follow-up.
Reporting procedure.

3 Develop training material. There should be at hand training-guide material for all jobs or classes of work from which specific training schedules can be developed that will insure an effective and orderly disposition of the training needs of the veteran.

4 Special procedure for rehabilitation, placement, and training of the disabled veteran, when normal procedures are not adequate.

All of this presupposes the existence of a good healthy liaison between company and employees now in service, and an earnest desire on the part of the company to do a good job.

One company or a few companies alone cannot be very effective in meeting the total problem. All industry and every individual company must face this responsibility and be ready to meet it adequately if we are to avoid a state of economic and political confusion and a social and unemployment problem of possibly alarming potentialities.

"I am proud of our patent system, proud of its past record—a record which speaks for itself—and I sincerely believe that this record alone fully justifies its retention.

"There will be attacks made on it in the future, as there have been in the past, probably by individuals who have little knowledge of their subject. It would seem that a comprehensive discussion of the exact situation at the time would be all that is needed to retain the merits of our present system.

"Assuming that no disastrous changes are made in our patent system, certain trends in industrial research become obvious. Research has not yet come into its own with respect to many of the smaller units of industry. The larger units have been able, because of their position, to pioneer the general movements. This pioneer work was possibly too hazardous for the small units to undertake; but now that the exploratory stage is pretty well over and trained personnel is available for executive positions there is no longer any reason why the smaller units of industry should not make full use of industrial research for their own advancement and welfare. It may be argued that to be efficient a certain minimum-sized laboratory is needed and that small organizations cannot afford even this minimum size. There is much in favor of such an argument; but a co-operative or municipal organization can overcome this difficulty. Such laboratories are coming into existence already." From an address by Thomas Midgley, Jr., on "The Future of Industrial Research," before the Silver Anniversary Forum sponsored by Standard Oil Development Co., New York, N. Y., Oct. 5, 1944.

VETERAN RE-EMPLOYMENT

Comment[1] *on Three Papers*

By D. M. MASON

SUPERVISOR OF RESEARCH, GENERAL PERSONNEL DIVISION, ARMSTRONG CORK CO., LANCASTER, PA.

GENERAL Rose has mentioned the impossibility of any one speaker covering the entire area of veteran re-employment problems. This applies with even greater force to one attempting discussion and correlation. I shall therefore limit my discussion to one single problem which experience indicates as critical when an employer sets himself to the task of defining precisely *his* re-employment policy. That single problem is the basis or guide for re-employment to be adopted and on that, as you know from the speakers, an intense policy conflict exists."

It is rare that opposing viewpoints, in a national conflict, can be so clearly drawn as in the papers on veteran re-employment.[1] Let us not underestimate the seriousness of the conflict particularly to the businessman who stands in the middle with the union "seniority or else" to his left, and Selective Service Administration's "superseniority or else" to his right. Practicably, we want to know three things about this conflict:

1 What are the basic causes of the conflict?

2 What is the strength or weakness of the union-sponsored accumulated seniority basis for re-employment of veterans, as compared to that of the Selective Service's superseniority directive?

3 What action should the employer take?

SOURCE OF CONFLICT

The source of this conflict is clearly in the inept wording of the re-employment provisions of the Selective Service and Training Act. These provisions appear to regard seniority as attached to a job and are used as synonymous with "job right." Every union officer and business manager knows that seniority, in its common definition, attaches to persons, not to jobs, and is not a job "right," but a relative and constantly changing job "claim." The provisions are thus best described as meaningless.

Selective Service has, correctly, I believe, noted the intent of Congress to establish job rights, and hence has a basis for its policy of superseniority for returned veterans. The unions, and many company managements, reading the act and its mention of seniority literally favor accumulated seniority, honestly believing it to be prescribed for re-employment. None of the three parties, unions, business management, Selective Service, has taken the bold course of urging Congress to amend these meaningless portions of the law, although Canada and England have recognized inadequacy of similar laws enacted some years ago and have recently revised them. Hence there appears little chance that Congress will make the law meaningful. In such a case it will become meaningful only when the courts give their interpretations of its various portions as a result of cases prosecuted before them by Selective Service. Because it appears closest to Congressional intent, however misstated, the Selective Service Administration interpretation appears most likely to be upheld by the courts. However, such substantiation will not make superseniority practical by itself. Let us consider accumulated seniority versus superseniority as practical re-employment formulas.

SUPERSENIORITY VERSUS ACCUMULATED SENIORITY

The important point about superseniority is that, because it gives superior rights to certain returning veterans, it becomes very important to know which veterans have these superior rights. In other words, the restrictions in the act "temporary employment," "qualified to perform," "unreasonable or impossible to do so," become crucial. Selective Service has not hesitated to define the act's mention of seniority precisely and in detail, establishing in process of so doing the concept of superseniority. But Selective Service has not adequately defined these other terms, particularly the term "temporary position." The content of Selective Service regulation 190A on the latter is too modest: "Every case must be determined by the facts and circumstances in that particular case," and "The final determination rests with the courts." So of course it does, as also with the seniority definitions put forth by Selective Service. But one gets into the courts when led there by Selective Service and sundry government agents. These inadequate definitions of what Selective Service will use to check necessity for legal action leaves Selective Service saying, in the employer's estimate, "Go ahead, we won't guide you, but, brother, if we don't like what you do . . . . !"

The important point is that "temporary" is well-nigh impossible for the employer himself to define. Few employers are going to be ready to go into court and face widespread publicity to support a contention that a given veteran was "temporary" or, in the words of the act, had left a "temporary position."

By contrast, as Mr. Golden has stated, unions generally, and possibly a majority of employers, have favored accumulated seniority as the basis for sorting out job claims of civilians and veterans. Accumulated seniority has been favored on the following grounds mentioned by Mr. Golden:

1 It is a literal interpretation of the law, if intent is ignored.

2 It is clear-cut; every employee's seniority is an easily tabulated figure.

3 Since it applies uniformly to veterans whether "temporary or not," it avoids argument on this debatable term.

4 It accords with customary business practice where large changes in employment are to be made.

In favor of accumulated seniority, these additional observations can be made:

(*a*) Whether intent of Congress or not, I know of no employer who would consider discharging employees of 25 or 30 years of service to rehire veterans of 1 or 2 years of service, nor is such refusal unpatriotic.

(*b*) Each veteran I have talked with wants his own chance at a satisfactory job, not some other person's chance.

(*c*) Many thousands of civilian employees have been "as-

[1] Discussion of Management Division presentation of three papers on the general subject of veteran re-employment:

"Postwar Employment of Veterans," by Brigadier General William C. Rose, published on pages 9–11 of this issue.

"Problems of Returning Service Men From Labor Viewpoint," by Clinton S. Golden, published on pages 12-13 of this issue.

"Industrial Jobs for Returning Veterans," by Stewart M. Lowry, published on pages 14–16 of this issue.

signed to stay on their jobs" by Selective Service as in the nation's interest as against entering military service. They too have rights and deserve consideration from Selective Service and from their employers.

But in reviewing accumulated seniority as a re-employment formula, two cautions should be observed:

1 Seniority should be administered for this purpose on a plant or company-wide basis. Many existing seniority agreements, perhaps most, are on a departmental or occupational basis. Community opinion will not accept refusal of employment to a veteran of say 5 years' seniority, when a high-school youth of perhaps 1 year's service is retained by departmental seniority in another department of the same plant.

2 Seniority should be used only "to get the veteran in the door." Once in, his placement on the job should follow these two general criterions:

(*a*) Customary work; or

(*b*) Such better opportunity for which his military experience may qualify him.

3 Returned veterans with disability of a marked degree should be entirely exempt from seniority provisions since it is doubly hard for them to find a position with another employer in the open market.

In passing, too, it should be noted that strict seniority in layoff and in re-employment is still the exception today in industry. It is not the rule and therefore some violation of seniority in veteran re-employment will not jeopardize the seniority principle as actually applied in a majority of establishments.

WHAT SHOULD EMPLOYER DO IN FACE OF CONFLICT

Employers can be divided into three groups on the basis of wartime employment:

1 Those whose employment is now about postwar normal or below.

2 Those whose employment is 100 to 250 per cent of postwar normal.

3 Those whose employment is from 3 to 50 times postwar normal.

A different program is needed for each group. Mr. Lowry has outlined a splendid program for group 1, of which his company is a typical example.[1]

1 Plan to re-employ every returned company veteran.

2 Concentrate on planning for good placement and added opportunity for these veterans.

3 Make way for them by release of wartime temporary employees, housewives, the young, and the aged, applying superseniority for the veteran, in the few cases necessary.

4 Publicize your plan far and wide; reap the rewards of your fortunate position.

For group 3, i.e., those with tremendous and temporary wartime expansion, neither seniority nor superseniority is a practical basis for planning:

1 Carefully plot the desired postwar staff.

2 Review experience and training of present civilian force plus that of former employees in military service.

3 Earmark present civilian employees with unique experience specifically needed on the postwar staff.

4 Throw off the earmarked list any civilian employee if a service man has or can quickly get comparable experience upon his return.

5 The remaining earmarked civilian employees should be slated for retention, relying upon "qualified to perform," and "impossible or unreasonable" clauses in the Selective Service Act. (The retention list should be kept short and qualifications clear; borderline cases will be lost in court.)

6 Plan to re-employ veterans for every other position in the company, deciding between veterans on the basis of accumulated seniority, without regard to the temporary nature of any job, and avoiding the re-employment of any veteran if the seniority lists indicate that he is likely to be displaced shortly thereafter by a second returning veteran of greater accumulated seniority.

7 Announce your plans as soon as the effect upon present civilian employees will not be too unfortunate from a production standpoint.

This leaves for discussion the case of the average employer (group 2), who has experienced a 100 to 250 per cent wartime expansion of employment. In connection with employers in this class, it should be noted that experience indicates a 25 per cent increase in postwar employment over prewar employment will decrease by perhaps one half the number of difficult veteran-reinstatement problems. Employers in this class should be, and they appear to be, concentrating upon every possibility of additional postwar business and its by-product, increased employment. As a plan for action:

1 Adopt accumulated seniority as a basic guide for re-employment and for selecting civilian employees for release and replacement by veterans.

2 Once a veteran is "inside the door," disregard seniority in placement upon a job; give the veteran every possible consideration for improved job opportunity.

3 Ignore entirely seniority qualifications in the case of seriously impaired veterans.

4 When this policy indicates inability to re-employ a specific veteran making application for reinstatement, as of course it will in some cases the procedure should be as follows:

(*a*) Check the veteran's previous work history in your employment.

(*b*) If his *only* job with you was as replacement for an employee who earlier entered military service, or on a *type* of work which did not exist in your establishment before the war and which does not exist after the war, the refusal to re-employ the veteran should be stated as a final one, for the job he held was undoubtedly "temporary" within the meaning of the Selective Service Administration regulations.

(*c*) If the refused veteran was originally employed on a job definitely not in either of these two so-called temporary classifications, then you should carry to your local veterans' re-employment representative, at once, a full review of the circumstances in this case, your re-employment policy, and your veteran re-employment history to date. Fortunately, you can expect, as has been customary with other national administrative agencies, rather realistic handling of specific cases at the local level. If, however, the local veterans' representative insists that this particular veteran be re-employed, then get this demand in the form of a written order, and re-employ the veteran, choosing on the basis of accumulated seniority some nonveteran employee for release to make a place for the veteran.

(*d*) The written order for reinstatement, together with the threat of unfavorable local publicity will be deterrent upon violent objections from your union. By so complying with the Selective Service Administration's directives in such specific cases you are being logical in handling the problem, for the probabilities are clear that should you refuse and elect a trial of strength in court, you will lose and in any event, win or lose in court, will certainly lose in terms of poor press publicity in your community.

In summary, basic personnel policies must always be established after careful consideration of public opinion and sentiment. Public sentiment clearly today favors re-employment of veterans with their original employer in every case possible, and minor conveniences or past organization practice are not likely to be accepted by your community as justification for not so doing.

An Experiment in MANAGEMENT EDUCATION

By R. C. MUIR

VICE-PRESIDENT IN CHARGE OF ENGINEERING, GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y. FELLOW A.S.M.E.

EXPERIENCE has shown us and psychologists confirm the fact that the mind may retain its alertness and receptivity, if we train it that way. In fact, in the words of Sir Richard Livingstone,[1] "periods of systematic study are as necessary to the intellectual vigour of the mind, as periods of recreation to the health of the body . . ."

In industry, as in every other segment of modern society, we should have some kind of educational or study program available for everyone, without regard to age or occupation. Again, in Sir Richard Livingstone's words,[1] "A man lives with details and immediate problems in the narrow deep-sunk pit of his daily work, and needs at times to climb out of it and look around; to see not only the department with which he is concerned but his occupation as a whole, and that occupation's place in the wider order of things; to remember that principles should guide individual decisions and to consider what these principles are; to study related problems and methods in other institutions and countries."

Most men in industry, now carrying management responsibilities, have learned what they know of management through the hard school of experience, often at the expense of valuable time and costly errors in judgment. Others have been tried in management positions and failed, a costly procedure for any business. In our own company, we had always done pretty well by the younger men in the way of training programs, but not so much for older employees.

It was with these observations that a company group, in 1943, concluded that a well-devised course of study and practice might improve the management technique of a large proportion of those in supervisory positions and might avoid much of the time and expense of bringing new men up to the standard of successful managers.

DESIGNING A CUSTOM-BUILT MANAGEMENT COURSE

We felt that no "cut-and-dried" course in management could serve as well as a course that was custom-built. There were the history of the company, its traditions, its products, its aims and objectives, its type of organization, its personnel, and the public it served to be taken into consideration, and so we concluded it was better to design our own course, making use of what we had learned from experience in our own operations and what we could learn from the multitude of published material on the subject.

Any good manager or executive should always keep in mind that there is almost invariably someone in his organization that can do any one specific job better than he can. A cardinal rule for management is to specialize in management and leave it to other specialists to carry out their specific tasks or functions without interference, except for broad direction and co-ordination. Therefore, we set down as one of our policies that we would not try to teach the techniques of accounting, law, sales, engineering, or manufacturing. Rather, we would emphasize the importance of taking advantage of the services of specialists in these various fields of activity when confronted with a situation which requires their expert advice or assistance. The only technique we would teach would be that of management.

Each of the many lines of products of the company is managed by a committee composed of the division sales manager, the division engineer, and the division factory superintendent.

The course was designed for employees down to the management-committee level, or those who are immediate prospects for management committees. Later, it is probable that the course will be extended to those in supervisory positions at lower levels. Eventually, we hope to devise a program which can be given to all employees entering the company directly from college or to those who have completed the apprentice courses. It is recognized that many of these employees will not become supervisors, but we can see no disadvantage in having all of our employees at this level understand the problems of management, and there will be some with managerial aptitudes who will build upon this early training within the company.

OUTLINE OF COURSE

The first half of the course, i.e., six class periods, is devoted to the nature of business, and the second half, also six class periods, to the problems of management, largely from the personnel side. An outline of the course follows:

COURSE IN BETTER BUSINESS MANAGEMENT

First Half

NATURE OF BUSINESS

Class 1	Objectives of industry and objectives of this course
Class 2	Starting or expanding a business enterprise
Class 3	Importance of cost and its elements
Class 4	Measuring progress and efficiency of the business: Statement of profit and loss
Class 5	Setting up organization for the business
Class 6	Presentation to board of directors concerning the new business enterprise

Second Half

PROBLEMS OF MANAGEMENT

Class 7	Relations among members of management group: Control of operations
Class 8	Relations with people in other departments, divisions, districts, works, affiliated or associated companies
Class 9	Human relations
Class 10	Relations with employees: Training program
Class 11	Relations with organized groups: Labor relations
Class 12	Selection, training, and placement of men

We have found it advisable to bring the group together before the first class and deliver the first and only lecture of the course, "The Objectives of Industry." This lecture begins as follows:

"Today we are starting a 'Course in Better Business Management.' We shall begin with a general discussion on industry, and its motivating forces, to set the stage for the course to follow."

This lecture distinguishes two types of objectives, i.e., (1) the broad fundamental role of industry is to render service to

[1] "The Future in Education," by Sir Richard Livingstone, Cambridge University Press, 1941.

Contributed by the Management Division and presented at the Annual Meeting, New York, N. Y., Nov. 27–Dec. 1, 1944, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

society; (2) the individual and the business organization are motivated and supported by profit.

We use Dr. Fred I. Kent's primitive example to explain how profit is the result of enterprise, which builds for others as well as for the enterpriser. Then there is given a brief history of the company to indicate that it follows the pattern of Dr. Kent's hypothetical case. In this history, it is shown how each branch of the business has been ably supported by specialists in science and engineering, manufacturing, sales, and corporate affairs, so necessary to give the company a well-balanced executive group. Later, the qualifications of the theoretically perfect manager are outlined, and instructions for the conduct of the course are given.

The philosophy underlying practically all of our educational courses is learning by doing, rather than by listening.

PROBLEMS RELATE TO REGULAR BUSINESS CONDITIONS

The class to the largest possible degree is self-instructed, and the problems approach as closely as possible conditions which would apply in regular business.

At the first class, the chairman calls for a discussion of this first lecture, and with that out of the way a problem is selected which will carry through during the five following sessions. The problem deals with the organization and conduct of a business.

The interest in the course and its success may depend in a large measure upon the selection of a realistic problem, that is, the choice of the business enterprise which is to be undertaken.

The text for the second class treats generally of the matters to be taken into consideration in launching a new enterprise, such as a market survey, competition, whether the product is one which the company can engineer, manufacture, and exploit to advantage, and the like. It also treats of different methods of financing a business, and of capital; methods of raising capital; and turnover of capital as a yardstick of successful operation. In presenting the problem, a brief statement is made as to whether or not the proposed product meets these general requirements, the estimated amount of business, and then the capital-investment account, including buildings, equipment, inventory in process, finished stocks, receivables, and cash, is set up.

The third class deals in general with the importance of cost and its elements. The presentation of the problem consists in giving detailed costs of the product with data to substantiate these costs.

The text for the fourth class is a general treatment of measuring the progress and efficiency of the business, and the statement of profit and loss. The problem period is devoted to a statement of profit and loss on the product for each of the 5 years ahead.

The text for the fifth class is devoted to organization, and the problem consists in setting up the engineering, the manufacturing, and the sales or distribution organization and demonstrating how these fit into the company organization at large.

In the sixth session, the class constitutes a board of directors, and the chairman or someone whom he designates presents the problem to the board for its acceptance or rejection.

CLASSES LARGELY SELF-INSTRUCTED

We have found that in these six short sessions those in the class have obtained a very good perspective of the nature of business and have grasped the factors pertaining to business that they will ordinarily encounter in their respective positions.

In the conduct of the classes, we have broken away from the usual academic methods of instruction. The classes are limited to 12 members, each of whom must act as a chairman of one meeting. The duties of the chairman include keeping the discussion of the subject within bounds. We have found that there is some advantage in the chairman's running the meeting on a somewhat formal basis where each member of the class addresses the chair when making comments. The chairman usually assigns the working up of the problem for his class to certain members and requests them to present the material they have prepared. There follows a lively and spirited discussion. At the end the members of the class are free to criticize the chairman's conduct of the class.

The same procedure is followed in the second half of the course. The class chooses its own case problems, preferably those suggested by the experience of the members of the group. This offers an excellent opportunity for members to bring in actual problems confronting them, and to gain experience and the assistance of the class in dealing with these problems.

The problems are not merely discussed but are acted out with members of the class representing the individuals concerned with the problem. For example, in class 7, the problem usually chosen is, "The profit and loss statement of the business indicates that the gross margin attained after three years was somewhat lower than that estimated when the business enterprise was entered into. What is the proper approach to correct the difficulties which this business has encountered?" The chairman has appointed at the previous class three members to represent the engineer, the manufacturer, and the sales manager, and he calls upon these three for a meeting of the management committee. These three hold a meeting of the management committee before the class, and then an open discussion or criticism follows.

In class 9, the problem usually relates to some definite personnel problem, such as an employee requesting a salary increase; and in class 12, a favorite problem is the transfer or retirement of a man in a managerial position so that a younger and more capable assistant might succeed him. Members of the class are chosen to represent the employee asking for the increase, and the division engineer, and they carry out the interview before the class. Similarly, in class 12 one member of the class represents the works manager while another member represents the employee who is to be retired. The problem is for the works manager to retire the employee or to assign him to another position, retaining his good will toward the company. The class member, representing the division engineer or the works manager, is then criticized for his handling of the case.

It is preferable to have no rehearsal, but to have each member who is to act a part know the problem a week ahead and to make it realistic.

It is not the intent of these classes to make personnel or human-relations experts in six short lessons. Rather, it is to indicate the nature of real management problems, and the necessity for continuing to devote a great deal of time and attention to this part of the management function.

It is desirable to have one member of the class act as secretary or co-ordinator for the group. The duties of this member will be to assist the chairman at each meeting in the details of organizing the session, and also to assist in writing up the problem.

We have found that those who have participated in previous classes are very happy to act as sponsors to later classes. The functions of the sponsor, however, are simply to observe and act as consultant, but not to teach the class.

The meetings may be either luncheon or evening sessions, depending upon the desire of the class. The length of time required for discussion of the text and the presentation of the problem chosen averages about $1\frac{1}{2}$ hours at each session.

COMPOSITION AND SCOPE OF CLASSES

In each class of 12, we try to have representatives from engineering, manufacturing, sales, and accounting divisions, and, in as many classes as possible, we have representatives from other functional departments, such as law, patent, and financial.

Thus far, more than 500 employees have participated in these classes in Better Business Management, and uniformly there has

(*Continued on page 24*)

Upper MANAGEMENT *in* TRAINING

By GUY R. COWING

ASSISTANT DIRECTOR, GENERAL MOTORS INSTITUTE, FLINT, MICH.

WE all appreciate the job that has been done by industry in meeting the tremendous job of expansion and conversion in the war effort, and industry, as a whole, knows that that job is not yet done. In the days ahead there will be even greater problems for which preparation must be made now.

Dr. W. E. Wickenden, president of the Case School of Applied Science of Cleveland, in an address made in connection with the Twenty-Fifth Anniversary of the Institute with which the author is associated, stated:

"The destiny of free enterprise, and possibly of free government, is hanging in the balance. What many do not realize is that they are in the balance together. The industrial corporation is one of the greatest inventions of the last two centuries, as great an invention as the creation of effective instruments of democratic government. The two, in fact, have grown up together, and each is indispensable to the other. Each is essentially an expression of the ideal of freedom, a voluntary pooling of resources and effort, for tasks too great for individual capacity.

"Whether justly or not, public confidence in the industrial corporation as an instrument to serve the general good has been severely shaken . . . The need of the hour is to restore public confidence in corporate industry as an instrument of human services and progress."

In his address, Dr. Wickenden recognized that management is the directing force of the corporate industry. He also recognized the degree to which its leadership must point the way to the restoration of that confidence in industrial organization as an instrument of human service and of progress.

However, no such questions have been raised with reference to the ability of the same corporate industry to develop and produce the physical instruments of war and peace, undoubtedly owing to the record established more recently in the magnificent job of meeting the ever-changing demands of the combat areas through continuous effort in the field of research and development in materials and processes.

Certainly one of industry's prime assets is its technical and executive organization, and its future depends largely upon the potential leaders under development in its operations. The application of research principles to the development of this primary asset of industry, as well as to the development of its products, is worthy of emphasis. It is reasonable to expect that an approach similar to that which has brought about improvements in industrial products may also result in progress in the development of present and future leadership. This approach has a particular application to the solution of the problem of restoring the public confidence in the industry "as an instrument of human service and progress."

Dr. C. F. Kettering, "Boss Ket" as he is familiarly known, is quite apt to say in his addresses that in product research comes first. If he were speaking of education and training in industry, he would undoubtedly say with us in the Institute that in building an organization, men come first.

At the Institute, we have attempted to apply the principles and methods of research and product development to the training of men and, in discussing the subject of this paper, I will draw from this experience within the General Motors Corporation.

Contributed by the Management Division and presented at the Annual Meeting, New York, N. Y., Nov. 27–Dec. 1, 1944, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

DECENTRALIZATION IN MANAGEMENT

The keystone of General Motors' operating pattern is decentralization, reliance being placed on individual initiative, freedom of action, and recognition of the importance of the individual as such. The personnel are so familiar with their type of organization that they are likely to assume that everyone understands it as well as they do. Briefly, the corporation consists of a number of divisions, each under the jurisdiction of a general manager, and these divisions range in size from 1500 employees to 60,000. The general managers have control over the operation of their divisions within the broad policies established by the corporation, and their responsibility and authority can be compared to the responsibility and authority of the president of a large manufacturing concern.

Therefore, though we of the Institute work in a relatively large organization, it is a decentralized organization, and our experience—our analysis of the problem and plans and methods for its solution—may be helpful to those connected with relatively small firms as well as to those whose organizations are larger.

Any sound analysis must recognize that the building and development of the supervisory and executive organization is the responsibility of management, and that much of this responsibility is in the very nature of the case discharged in connection with the functioning of the organization and in the day-to-day contacts on the job. This applies to all organizations, large and small.

Experience has proved, however, that part of the necessary training can be done effectively by organized group methods, provided the training, so conducted, is in harmony with management policy and provided, further, that it is closely coordinated with the development that occurs in the day-to-day contact on the job.

FUNCTION OF THE INSTITUTE IN TRAINING PROGRAM

Over some 25 years of experience, such training has been carried on by divisions of the corporation, separately, and through the Institute. This has been accomplished without a break, with a frequent pooling of thought and experience through the Institute, and with a constant emphasis on the flexibility necessary to meet the needs of all various divisions.

The Institute therefore does not have a management-training program as such, but it does maintain a central pool of training materials, experience and assistance, which are available to the divisions on whatever basis will contribute most effectively to their training programs. Furthermore, the Institute provides a focal point or central training research and development agency through which corporation-wide experience may be pooled for the improvement of training materials and methods.

FACTORS COMPRISING A PROGRESSIVE ORGANIZATION

Some months ago, another careful review and pooling of corporation-wide experience during the war period was made with

the assistance of an advisory council, representative of management-training activities throughout the corporation. In beginning this review, a list was made of the more important factors that affect the building and maintaining of a progressive organization, as follows:

1 Building executive potential into the worker organization.
2 Selection for first-line management job.
3 Basic training for management.
4 Placement on management job.
5 Initial management training.
6 Mechanical and technical training as needed.
7 Improvement rating of management personnel.
8 Follow-up on the job.
9 Up-grading and promotion.
10 Management conferences for organization development and team training.

Several of these factors have a direct bearing upon the subject of the present discussion. The first of these, i.e., building executive potential into the worker organization, is not only important but necessarily must be a long-range program. It is an application of the adage of the mining districts, "You cannot make high-grade metal out of low-grade ore."

The importance of the second factor, i.e., selection for management jobs, is readily recognized when it is recalled that the foreman is first in management in the sense that he is the point at which the building of the management begins. Since this means that in this process of selecting foremen, future general foremen, superintendents, and plant managers are also being selected, it becomes a direct management responsibility of first importance.

Similarly, placement, improvement rating, follow-up, upgrading, and promotion are important direct responsibilities of the operating management.

The nature and extent of mechanical and technical training needed vary with the circumstances in the plant, the levels of executive responsibility, and often with the individuals as well. Where needed, however, they are frequently very vital factors in the success of the enterprise.

FUNDAMENTAL TRAINING OF FOREMEN FOR MANAGEMENT

However, the factors "basic training for management" and "initial management training" really constitute a management induction training which at the present consists of two parts:

1 The basic management-training program is a full-time, 2-week intensive training given apart from the plant, at the Institute, between the time of selection for supervision and placement on the job. This program is an outgrowth of a considerable amount of work done in this area over the years, which was brought to focus by the war problems. It has already proved to be very effective and to bring very satisfactory results from an operating standpoint. After all, we have considered it necessary to use 4 years to build a mechanic and yet we have frequently made foremen overnight.

2 The new foreman upon his return to the plant participates in what is called "initial management training." This is training for the new foreman to provide the specific preparation needed for his new job in his particular plant and division.

On the completion of his initial training, the new foreman begins to take part in the longer-range development programs in which the organization as a whole participates. These management conferences for organizational development and team training provide:

1 Training to enable members of the management organization to meet the requirements of new developments and changing situations as they occur and also to meet the increased responsibilities of new positions on promotion.

2 Team training, to bring about uniform understanding and uniform functioning, i.e., teamwork, throughout the organization.

From a training standpoint, the building of management organization corresponds somewhat to the training required for a football team. In the case of the football team the individual requires training in the fundamentals of football, and the group in co-ordinated team play. Similarly, in executive organizations, there is need for training and development of individual members and for bringing about understanding of policies, procedures, etc., to provide the basis for uniform understanding.

If we analyze the functioning of the individual in various levels of the executive organization, we will find this to be true. At the lower levels, effective operation is highly dependent upon the ability of the individual to meet the technical and skill requirements of the worker's job. But as we go higher, the executive finds himself farther and farther removed from the actual performance of production operation, and his effectiveness is highly dependent upon his knowledge and skill in the use of the executive organization itself as a co-ordinating medium between him and the workers' jobs. Team training therefore becomes of ever-increasing importance to those in upper levels in their effective operation within their jobs.

The success and value of this type of training to the individual, regardless of level, is primarily determined by the extent to which it is directed and guided and, in some instances, conducted by the upper management group and actually becomes a management program.

TYPICAL DIVISION MANAGEMENT-TRAINING PROGRAM

There are many different patterns for reaching this objective in the various divisions but the following will be illustrative:

The training in a given plant is directed by the manager and his key executives who form the master conference group. The nature of the training to be given is determined by this group and the various sections are reviewed by them step by step as the training advances. The points that should be emphasized are decided upon before being considered by intermediate groups and by other groups down through the executive organization. The intermediate groups also bear a submaster relationship to the training, suggesting points that should be emphasized in dealing with foremen and executives reporting to them.

Problems and situations requiring management action or policy ruling which are brought out in the discussions are reported back to the master group session. Necessary action or policies are then decided upon and are then carried down and discussed with the lower groups. This cycle or two-way flow is repeated until a common understanding is reached, thus providing a basis of uniform understanding throughout the organization.

It is probably almost axiomatic that the development of ideas or plans for the instruction of others, or the active participation in the instruction of others, is one of the best learning devices known. Upper management, actively engaged in the team training of its organization, in a large measure also meets the objectives of individual training, in the levels necessary to meet the essential requirements of their own jobs, in the use of this organization or human mechanism by which and through which they meet their responsibilities of leadership within the enterprise.

To make it possible for each division to have its own specific training and yet have it based upon and utilize the accumulated experience of the entire corporation, requires a very flexible over-all program. To accomplish this, basic or course materials are available on a unitized basis at the Institute, arranged in what we call a "cafeteria counter" from which they can be selected in any order needed, and adapted and applied quite readily to the specific requirements of any division. There are something over 200 of these training units available, arranged in 33 different sections.

(Continued on page 31)

The Contribution to ORDNANCE RESEARCH *and* DEVELOPMENT *by Technical Associations*

By MAJOR GENERAL LEVIN H. CAMPBELL, JR.

CHIEF OF ORDNANCE, UNITED STATES ARMY, WASHINGTON, D. C. MEMBER A.S.M.E.

IT is my happy privilege this afternoon to greet the officers and members of The American Society of Mechanical Engineers and to express the heartfelt gratitude of the Ordnance Department for your invaluable contributions to the success of the armament program.

Earlier this year, Ordnance presented its Distinguished Service Award to this Society "In Recognition of Outstanding and Meritorious Engineering Advisory Services, in War and Peace, for the Development, Manufacture, and Maintenance of Ordnance Matériel." Today I should like to add my personal appreciation for your past achievements and to express the hope that the same fruitful co-operation which has characterized our joint Industry-Ordnance efforts during these critical war years may continue, without interruption, during the no less momentous peacetime era.

I am deeply conscious of the fact that, for a good many years, we in Ordnance have been following and utilizing your accomplishments in the development and manufacture of thousands of combat items. This Society has been so closely associated with Ordnance activities that we have come to regard it as an essential element in the Ordnance system. It has been performing work of great importance in furthering the national defense of our country. The leadership and valued counsel which you have provided have been, and are, of inestimable aid to the Ordnance Department in the performance of its heavy responsibilities.

I notice from your program that the Society is looking ahead, and planning ahead, for the coming days of peace. Ordnance is also planning for the future. Upon this occasion, I should like to record in your presence a plea for Ordnance research and development for peace.

Let me explain briefly why this subject deserves serious consideration now.

That part of the United States Army which is responsible for the engineering, design, development, and improvement of our weapons is the Ordnance Department. This is a traditional responsibility which has existed since the days of Decius Wadsworth, first chief of Army Ordnance in 1812. Armament development as carried on by the Ordnance Department at its arsenals and proving grounds, and in conjunction with the technical and scientific organizations of our country, has been responsible not only for our superiority of weapons in time of war, but for many of our advancements to better living in time of peace. It was the influence of the Ordnance Department and the handiwork of the New England gunmakers early in the nineteenth century which brought to rifle design and production the principle of interchangeability of parts. That principle, born of the musket, carbine, and the shoulder rifle, is today responsible for the mass production through which American industry has attained the very pinnacle of higher quantity output with lower unit cost. Our industrial supremacy today rests firmly upon the doctrine of interchangeable parts which Eli Whitney, working in conjunction with Army Ordnance, developed decades ago.

Again, metals progress in our country and throughout the world owes much of its speed and thoroughness, to say nothing of its applicability in modern life, to ordnance researches in cannon and projectile making. Gunmaking in the United States pioneered in the field of new and stronger metals, so that at the close of the nineteenth century vast industrial fields were opened up in the realms of transportation and of construction due to the impetus of the armsmaker aided and guided by the metals scientist and technologist.

So I might recount in many specific ways the co-operative endeavor between science, industry, and Ordnance throughout the years. Equally might I narrate the general advances that have come to all our people as by-products of this co-operative endeavor. War utilizes all the things of peace and improves them at a tempo so quickened that within the past four years scientific advancements have been made which might otherwise have required generations. Conversely, peace utilizes the advancements of war. Despite its suffering, its cost in lives and money, and its sorrows, there are scientific gains from this conflict which generations of men will bless until the end of time.

The pity is that much of this progress has been wrought under great danger when hazards were such that our national existence was at stake. We must never forget the lesson we have learned since Pearl Harbor, and in no field is that lesson more important than in the need for constant research and development as applied to weapons for our national security.

The record of weapon research and development until 1940 is not a glorious one. The Ordnance Department of the Army, responsible for the design and development of our fighting equipment, did not receive in time of peace funds sufficient to carry forward research on a scale equal to any of our comparable industrial organizations. It was a great day for weapons' progress in our country, ten years ago, when as much—or as little—as $7,000,000 was appropriated in one year, not for research and development mind you, but for the operation of the entire Ordnance Department of the Army—its arsenals, depots, and proving grounds, and yet when war came that responsibility rose in money value to more than fifty billion dollars in in one year. Those figures speak for themselves, and I will not attempt to elaborate on them. I will only record the firm belief that our weapons' superiority—and therefore our national security—in the years to come will be in direct ratio to the time, energy, and money we allot to armament research and development. Adequate funds will be a small premium to allot to this form of national peace insurance. Let us hope that our experiences in this war will confirm all our fellow citizens in the wisdom and urgency of such a course.

Further than that let me suggest that armament research and development for victory now and peace in the years to come can best be carried forward by the scientific, technical, and in-

An Address delivered at the Annual Meeting, New York, N. Y., Nov. 27–Dec. 1, 1944, of THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

dustrial establishments of our country. Armament progress needs the impetus of free competitive research and will thrive only when the brain power of our nation at large is given to the task. Thus I would urge that armament research, after the peace is won, be carried on for the Ordnance Department by such societies as this. To you, gentlemen, we should come with our problems in peace as we are doing in war. Before you we should lay the strategic and tactical needs of our fighting forces. To you we should delegate the responsibility for which you are so pre-eminently equipped. We should tell you simply that our soldiers need a weapon of certain characteristics and that certain researches in the field of pure and applied science are required if our needs are to be met. In your research laboratories, in universities, and other private institutions, this work should be done. The traditional viewpoint of Army Ordnance is to utilize the facilities of private industry. This applies to the laboratory as well as to the factory.

At the moment our great concern is victory. Once the victory is won our interest in weapons' preparedness should be as keen as it is at this moment. We should be prepared to embark upon a program of Ordnance research and development, and The American Society of Mechanical Engineers should continue the work it is now doing.

In the Ordnance Department we have, and now are encouraging the formation of, special Ordnance Committees in all our larger engineering and technical societies. You have such an Ordnance Committee already in existence in the A.S.M.E. Throughout the entire range of Ordnance activities these committees will be of inestimable value to Ordnance progress during the years to come. I do hope that every major engineering and technical society in the country will have its own Ordnance Committee for co-operation with the Ordnance Department in these important fields. I hope further that these committees will be in existence before many months have passed.

The future of our military preparedness in the United States is both a question of manpower and weapon power. The weapon power will be attained not by vast accumulations of guns and armaments in storehouses, but in your laboratories and industrial establishments. Our universities will train not only incipient soldiers but future scientists who, while they chart the peaceful progress of our nations, will not be unmindful of our weapon needs. American science and industry have wrought great things for victory in this war. Theirs is the responsibility to continue our armament research and development hand in hand in the years of peace. Their co-operative endeavor will be an assurance of peace. If war comes again, in this relationship will be a guarantee that by maintaining our weapons' superiority we will again save countless lives and treasure by our scientific and industrial readiness. On Ordnance Research and Development, with the help of all the members of The American Society of Mechanical Engineers, and other technical and scientific groups, rests an important element of our structure for peace in the days to come.

An Experiment in Management Education

(Continued from page 20)

been a keen interest on the part of nearly everyone. Those participating have worked hard and it has taken much of their time, particularly out of hours, but there has been no complaint; in fact, most of the participants say it has not seemed like work, it has been a diversion. The classes provide a much needed open forum with guided discussion, and the participants learn the importance of the other fellow's job, and acquire a more wholesome respect for their associates in an activity other than their own. All classes evidence much good fellowship, and on their own initiative the participants have always gotten together for a graduation dinner.

All in all our objectives are to help each man in a management position "see not only the department with which he is concerned but his occupation as a whole, and that occupation's place in the wider order of things; to remember that principles should guide individual decisions and to consider what these principles are; to study related problems and methods in other institutions and countries." We intend to keep the course fluid, and to introduce constantly new ideas, to the end that better management methods and techniques will be developed.

We also expect that supplementary courses of particular interest to specific divisions of the company will develop. There is already some evidence in this direction, in that a number of the classes are having meetings from time to time to discuss general affairs or problems of their own.

Our experience may serve as a guide to other organizations in getting such a program under way.

ORGANIZING THE COURSES

Naturally someone had to sponsor the program and lay out a plan. As chairman of the Education Committee of the company, this assignment fell to me. After laying out the course and writing the first lecture on the objectives of industry, I chose as a secretary a man particularly well fitted to gather the material, co-ordinate it, and prepare the text for the next eleven classes. This secretary incidentally is in charge of our Market Analysis Division and is a graduate of the Harvard School of Business. Next, I chose thirteen others in management positions—all young men, two from Publicity, two from Sales, two from Accounting, one from Corporate Affairs, three from Engineering, and three from Manufacturing—and asked them if they would join me in taking a course in Better Business Management, which we ourselves would prepare as we went along. They responded enthusiastically.

We met at luncheon, the first lecture was read, and the course was outlined. We chose the product which was to be the basis of our new business venture, and we appointed chairmen for each of the meetings which were to follow. Each chairman co-operated with the secretary in writing the text for the next class. The text was distributed ahead of time and each member sent in his criticisms. These were discussed at the class, and the secretary then completed the text in its present form. This initial group continued the weekly meetings until the course was completed. We all learned something, and we all enjoyed it.

Each member of this initial group volunteered to act as a sponsor for new classes, and at our main works five classes of 12 members each were started. The text, with the initial problem and its solution or presentation, was sent to other works and offices, and where desired a sponsor was sent to get the class under way at its first session. From all locations, we have had an enthusiastic response, and we have obtained many suggestions for improving the course.

Our experience has shown that a course in management can be developed and put into operation with remarkably little effort and inordinately great rewards both for the individuals and the company participating. Such courses rapidly tend to become self-energizing and self-perpetuating. What extra work is involved in their original sponsorship generally comes more nearly under the heading of recreation than drudgery.

HEAT-STABILIZED COMPRESSED WOOD—(STAYPAK)[1]

By R. M. SEBORG, M. A. MILLETT, AND A. J. STAMM

CHEMISTS, FOREST PRODUCTS LABORATORY,[2] FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE

BY compressing wood under conditions that cause sufficient flow of the lignin (the cementing material between fibers) to relieve the internal stresses resulting from the compression, it has been found possible to eliminate the springback tendency encountered in the usual densified wood. When wood is compressed at higher temperatures and moisture contents than are normally used, it does not, when swollen, tend to recover the original uncompressed dimensions. Wood so processed has been named "staypak" by the Forest Products Laboratory.

Staypak has distinct advantages over both the normal densified wood,[3] or "improved wood" as it is sometimes called, and compreg.[4] Whereas densified wood tends to lose its compression to a marked degree under conditions that cause swelling; staypak, although it will swell appreciably, will return to practically the original compressed thickness on drying to the original moisture content.

The behavior of compreg with respect to recovery of its original dimensions varies, depending upon the conditions under which it was manufactured. Because of the stabilizing influence of the resin, it is possible to make compreg with negligible springback tendencies. The advantages of staypak over all compreg, however, lie in its strength characteristics. Although the shear strength parallel to the grain and in a plane perpendicular to the direction of compression of the wood is appreciably lower for staypak than for compreg, the impact strength is about double, and the tensile and bending strengths are approximately 25 per cent more than those of compreg.

The manufacturing conditions under which staypak with the optimum dimensional stability can be made will be discussed, together with the characteristics of the material thereby obtained, the species and form of wood that may be used, and the possible uses of the final product.

EFFECT OF MOISTURE CONTENT-TEMPERATURE-TIME VARIABLES IN MAKING STAYPAK

A series of tests were made at the Forest Products Laboratory on yellow-poplar veneer to determine the best combinations of moisture content, temperature, and time of pressing to obtain panels with optimum stability. Yellow-poplar was used because it is compressed to a greater extent in making a high-specific-gravity product than are denser hardwoods, and consequently its tendency to recover from compression should be greater. The choice of yellow-poplar therefore should accentuate differences in the product made under different conditions. Compressed parallel-laminated panels 13.5 × 9.5 in. × about 0.6 in. were made from 21 plies of $^1/_{16}$-in. veneer glued with bakelite resin XC7381. All the panels were compressed at 2000 psi and at temperatures ranging from 300 to 360 F, using veneer conditioned at 30, 50, and 65 per cent relative humidity (moisture contents of 6, 9, and 12 per cent, respectively). The time that the center of the panels was held at the heating temperature was either 5 or 30 min. The results of these tests are given in Figs. 1 to 4, inclusive.

Fig. 1 shows the relationship between the specific gravity to which the wood is compressed and the moisture content, temperature, and time of heating. The wood conditioned at 65 per cent relative humidity compresses more readily than the wood conditioned at 30 per cent relative humidity, especially at the lower temperatures and shorter times, as a result of the plasticizing action of the additional moisture. An increase in temperature for the wood conditioned at the higher relative humidity has less effect upon increasing the compressibility than the same temperature increase for wood conditioned at the lower relative humidity. The wood conditioned at the higher relative humidity is sufficiently plasticized even at the lower temperatures to be almost completely compressed. An increase in the time has a similar effect. Under temperature conditions which do not cause optimum flow, increasing the time makes possible a greater extent of flow.

Fig. 2 shows that the water absorption, determined on 3 × 1 × $^3/_8$-in. specimens (1 in. in the fiber direction) according to the Army Air Forces method (1)[5] (weight increase after 24 hours' immersion), is much less for the specimens made from veneer conditioned at 65 per cent relative humidity than for specimens made from veneer conditioned at 30 per cent relative humidity, except at the highest temperatures. Increasing the time of heating for the less-moisture-resistant specimens also greatly decreases the water absorption.

A similar decrease in the equilibrium swelling and recovery from compression, and in the permanent recovery from compression after drying, occurs with increasing moisture content and temperature and time of heating (Figs. 3 and 4). These two tests were made on cross sections $^1/_8$ in. in the fiber direction that were immersed in water for 40 hr. The equilibrium swelling (Fig. 3) under conditions such that the recovery is small (values for material heated at 350 F and above) is about 25 per cent. The reason why this swelling is considerably greater than the swelling of normal wood is that the wood still retains its normal swelling tendency but, because the volume has been reduced to about one third of normal, the swelling per unit of reduced volume is about trebled. This increased swelling is not so serious as may be thought, for swelling of sizable pieces of highly compressed wood in the absence of a tendency to recover to the uncompressed dimensions, is extremely slow. Even in the small specimens of Fig. 7 the absorption of water is slow when the wood is properly stabilized. Both the rate and the total amount of dimension change occurring with time are considerably less than for the nonstabilized forms of compreg on the market (13). Staypak swells so slowly in sizable pieces that dimension changes and warping are negligible for most uses. The surface fibers of staypak, however, respond to humid-

[1] "Staypak" is heat-stabilized, compressed wood that has been heated, during the pressing process, under conditions such that the compression is not lost when the wood is subsequently swollen. Although it will swell appreciably, it will return to practically the original compressed thickness on drying to the original moisture content. It is thus wood that "stays compressed" (12).

[2] Maintained at Madison, Wis., in co-operation with the University of Wisconsin.

[3] Densified wood is normal untreated wood that has been compressed under conditions that do not cause flow of the lignin cementing material. It has been made from solid wood (4, 6, 7, 10, 11) and also from veneer preferably assembled with a synthetic-resin glue (2, 5, 6, 7, 9, 15).

[4] Compreg is resin-treated compressed wood which is stabilized in the compressed form by the resin (3, 13, 14).

Contributed by the Wood Industries Division of the A.S.M.E.

[5] Numbers in parentheses refer to the Bibliography at end of paper.

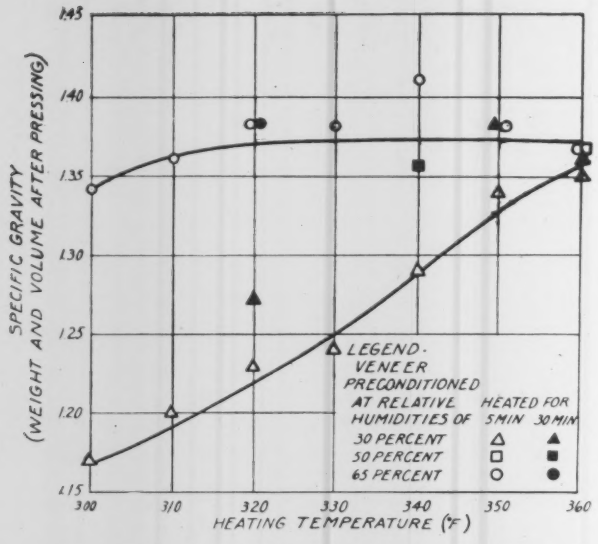


FIG. 1 EFFECT OF THE RELATIVE HUMIDITY AT WHICH THE VENEER WAS CONDITIONED, THE FINAL HEATING TEMPERATURE, AND THE TIME UPON THE SPECIFIC GRAVITY OF PARALLEL-LAMINATED YELLOW-POPLAR STAYPAK PRESSED AT 2000 PSI

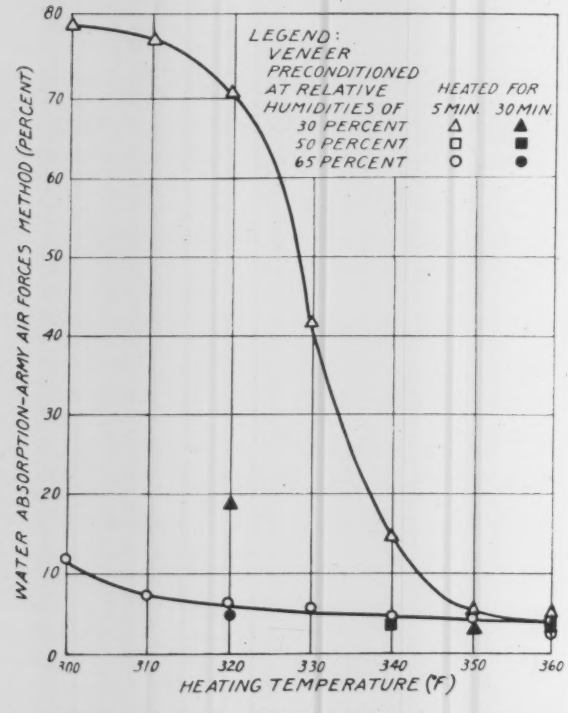


FIG. 2 EFFECT OF THE RELATIVE HUMIDITY AT WHICH THE VENEER WAS CONDITIONED, THE FINAL HEATING TEMPERATURE, AND THE TIME UPON THE WATER ABSORPTION OF PARALLEL-LAMINATED YELLOW-POPLAR STAYPAK PRESSED AT 2000 PSI

ity changes readily and, as a result, staypak weathers on the surface like normal wood, assuming a grayish color with many fine hair-line checks when exposed to direct sunlight and moisture changes for long periods of time without a surface finish.

The wood is appreciably darkened in color under the stabilization conditions used in making staypak. The darkening is undoubtedly associated with some chemical change of the lignin that occurs under flow conditions. The color change is so sensitive that a series of specimens of a single species arranged in the order of increasing darkness are in the order of increasing stability.

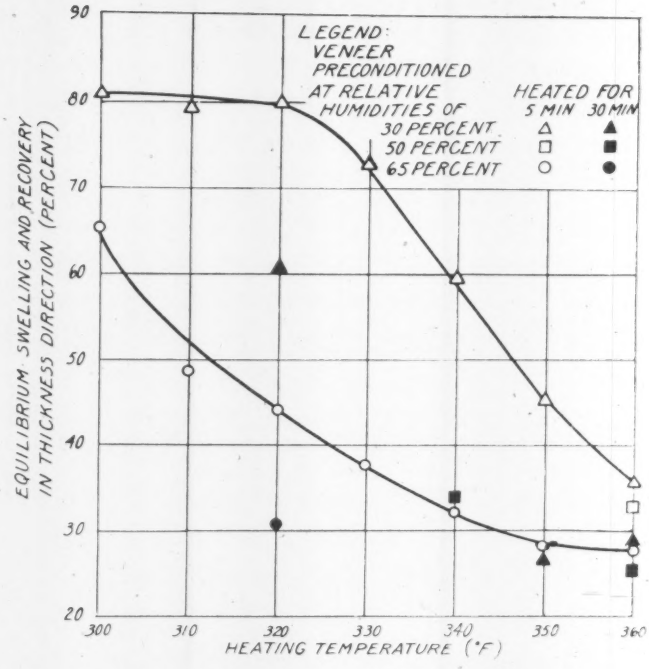


FIG. 3 EFFECT OF THE RELATIVE HUMIDITY AT WHICH THE VENEER WAS CONDITIONED, THE FINAL TEMPERATURE, AND THE TIME UPON THE EQUILIBRIUM SWELLING AND RECOVERY IN THE THICKNESS DIRECTION OF PARALLEL-LAMINATED YELLOW-POPLAR STAYPAK PRESSED AT 2000 PSI

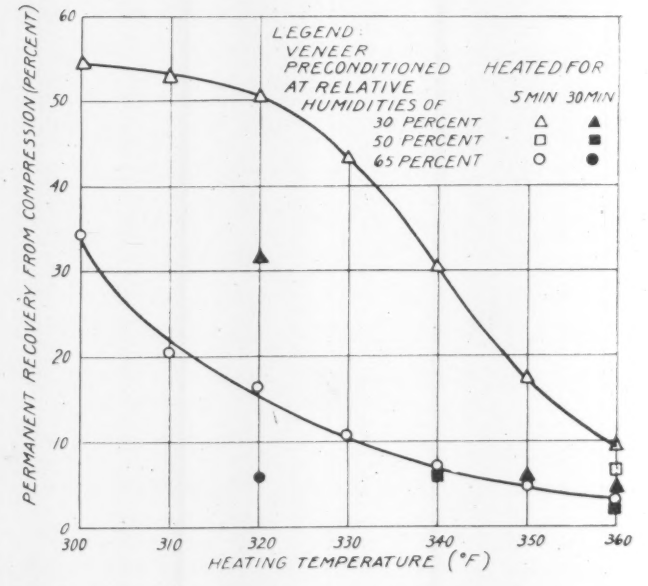


FIG. 4 EFFECT OF THE RELATIVE HUMIDITY AT WHICH THE VENEER WAS CONDITIONED, THE FINAL HEATING TEMPERATURE, AND TIME UPON THE PERMANENT RECOVERY FROM COMPRESSION, OF PARALLEL-LAMINATED YELLOW-POPLAR STAYPAK PRESSED AT 2000 PSI

Table 1 gives the properties of yellow-poplar staypak made from veneer containing 9 per cent moisture (in equilibrium with 50 per cent relative humidity) that was pressed at 2000 psi at a temperature of 340 F for different periods of time. The data indicate a progressive improvement in the stability as the heating time is increased. Comparison of the data of Figs. 1 to 4, inclusive, indicates that a 60-min heating period gives practically optimum stability properties.

The stabilization properties of 0.6-in-thick panels of staypak made from four species of wood, each at three moisture contents, together with the mechanical properties are presented in

Table 2. The equilibrium shrinkage between 90 and 30 per cent relative humidities is given in place of the equilibrium swelling and recovery on water soaking. The measurements were made in the thickness direction of the panel on 1/8-in. cross sections, as were the recovery measurements. In all specimens the water absorption was equal to or less than the 6 per cent allowed in the Army Air Forces Specification of June 10, 1942, for compreg, but not quite equal to the value of 2.5 per cent allowed in the revised specifications of March 15, 1944.

ATTEMPTS TO PLASTICIZE FURTHER THE LIGNIN

Attempts were made to plasticize further the lignin of the wood at the time of pressing by using yellow-poplar veneer previously treated with each of the following chemicals: 10 per cent of urea, hexamethylene tetramine, and formaldehyde, followed by conditioning at 30 per cent relative humidity and pressing at 350 F for 15 min. The compression was not increased nor were the properties improved. Due to the hygroscopic properties of urea, it had an adverse effect upon the stability. Treating veneer containing 9 per cent moisture with pyridine, an excellent swelling agent for lignin, also failed to give the expected increase in plasticity under stabilizing conditions. Attempts to make staypak with glycerine replacing the water plasticizer gave an inferior product.

Veneer treated with a diacetone-alcohol solution of lignin so as to increase the lignin content of the wood by about 50 per cent aided slightly in reducing the required compression pressure. The resulting staypak was darker in color and was more glossy than normal. The decrease in the required pressing pressure, however, was not sufficiently great to justify the treatment. It thus appears that the use of plasticizers other than water are not practical.

MANUFACTURING CONDITIONS

Stabilization Temperature. Although the data of Figs. 1 to 4, inclusive, and Table 1 indicate that the use of a temperature of 350 to 360 F would permit more rapid manufacture of staypak, experiments in making large panels of commercial size (54 × 14 × 5/8 to 1 1/4 in.) indicate that these temperatures are too high when used on large pieces because they cause blistering and checking. This degrade in large thick panels is due to the necessarily increased total time that the material must be in the press in order to get the heat to the center of the panels. The temperature range of 330 to 345 F has proved to be the most satisfactory for making large panels of staypak that are check- and blister-free, from birch and maple, using the lower temperature for the thicker material.

TABLE 1 EFFECT OF VARIATIONS IN THE STABILIZATION TIME OF YELLOW-POPLAR STAYPAK UPON ITS PROPERTIES[a]

Center of wood held at stabilization temperature, min	Specific gravity	Water absorption, per cent	Equilibrium swelling and recovery, per cent	Permanent recovery, per cent	Notched toughness, in-lb
10	1.35	5.8	47.7	19.8	135
20	1.36	4.3	38.0	9.7	141
30	1.36	3.5	33.2	6.4	130
60	1.37	3.2	26.8	2.5	125

[a] Wood preconditioned at 50 per cent relative humidity to 9 per cent moisture content pressed at 2000 psi, final stabilization temperature 340 F final thickness of panel 0.6 in.

Moisture Content. It is preferable to avoid moisture contents over 15 per cent; it is still better to use veneer at 6 to 10 per cent moisture content.

Excessive moisture (*a*) requires the use of excessive heat energy in raising the temperature of the wood to the required point, (*b*) increases the chances of the panel blistering or checking upon the release of the pressure, (*c*) increases the difficulty in properly bonding the plies together, and (*d*) gives a finished product that tends to lose moisture and shrink with time. As a moisture content of 8 per cent may be considered to be a good average service equilibrium value for most parts of the United States, all the developmental work on large panels of staypak has been confined to material conditioned at 30 to 50 per cent relative humidity to a moisture content of 6 to 9 per cent. The wood has invariably been conditioned both before and after application of the bonding resin. It is believed, however, that the conditioning prior to application of the bonding resin can be omitted when the veneer is originally at approximately the desired moisture content.

Subsequent exposure of the specimens to prolonged low relative humidity, as in heated unhumidified buildings during the winter months, and heating in an unhumidified oven at 140 F for 24 hr, showed that staypak made up at moisture contents appreciably above 6 per cent tends to end-check to some extent. Staypak that is to be used in heated buildings or exposed to the direct rays of the sun under low-relative-humidity conditions should hence be made from wood conditioned to 6 per cent moisture rather than the higher more suitable values for rapid stabilization.

Moisture Loss in Pressing. One of the chief difficulties encountered in making staypak is the loss of moisture from the end grain of the veneer during pressing. If the final pressing temperature is attained before the wood is highly compressed, sufficient moisture is lost from the ends to prevent them from being properly stabilized. Insufficient stabilization at the ends of the panels can be detected by eye, for then the ends are not so dark in color as they are when properly stabilized. Under conditions such that an appreciable amount of moisture is lost from the end grain, an excessive part of the panel must be trimmed off before use. To avoid this loss of material and to make the process practical, a number of ways of avoiding end-grain moisture loss were developed. The most effective of these is to load the press cold, apply the full compression pressure, and then heat to about 220 F at the center of the panel with the platens at about 250 F. The wood is compressed very slightly at first, but as the temperature rises to 220 F the compression becomes virtually complete. At this temperature the vapor pressure of water is only about 3 psi in contrast to the vapor pressure of 120 psi at 350 F. The tendency for moisture to be driven out of the wood under pressure up to this stage is therefore relatively small. The compression that occurs at 220 F, however, is sufficiently complete to bottle the contained moisture within the wood. Subsequent heating of the wood to 330 to 350 F after the compression at 220 F is fairly complete causes the desired stabilization and completion of compression with a much smaller moisture loss than occurs when the wood is immediately raised to the higher temperature.

Another aid to the stabilization of the wood under heat and pressure, that tends to reduce moisture loss from the end grain of the surface plies when veneer is used, is to cut the two face plies about 1/4 in. shorter than the other plies. The assembly of plies is laid up for pressing with the face plies 1/8 in. shorter at each end than the rest of the assembly. This causes the second plies to spread over the end grain of the face plies when the assembly is compressed and, as a result, seal off the end grain capillaries of the face plies. Because of the greater heating and higher average temperature of the face plies during the compression stage of the process, the face plies are more subject to moisture loss than the inside plies. It is desirable to follow this technique in combination with the first method of avoiding moisture loss in making the stabilized compressed product from veneer.

The end-grain moisture loss between the faces of the wood and the press platens or cauls may be minimized by a method that is effective for both veneer and solid wood. A strip of thermosetting glue about one-half inch wide is applied to the faces along the end grain. When the veneer assembly or the boards are pressed, this glue sets sufficiently to seal any capil-

laries formed between the wood and the press platens or cauls, thus preventing capillaries from carrying away water vapor.

A fourth method of minimizing moisture loss consists in dipping the end grain of the veneer sheets that have been spread with bonding resin 1/2 to 1 in. deep into a treating resinoid, such as one of those used for making compreg (3), for about 10 min. Sufficient absorption of resin occurs in the coarse capillary structure at the ends of the veneer sheets to seal the moisture in the wood as a result of curing of the resin at the time of pressing. When the veneer is similarly dipped prior to applying the bonding resin, so much resin is taken up, with resultant swelling, that the panels tend to spread excessively at the ends, when pressed, as a result of the greater thickness and plasticity of the ends.

The practice of end dipping after spreading of the bonding resin, followed by reconditioning to 6 to 9 per cent moisture content and then pressing under the two-step temperature rise conditions has been adopted as standard practice in making staypak. Under these conditions the amount of unstabilized wood that has to be trimmed off the ends is a minimum.

Pressure. The pressure of 2000 psi used in making yellow-poplar staypak (Figs. 1 through 4, Table 1), has been shown to be greater than necessary to make staypak under most stabilization conditions. Excessive pressure tends to cause a spreading of the panels that may reduce the shear strength at right angles to the direction of compression. Pressures of 1400 and 1600 psi appear to be adequate to give sufficient compression of yellow birch and sugar maple, respectively.

When too low pressures are used, the product is far less dimensionally stable than when it is highly compressed. For this reason it is recommended that staypak always be compressed to a specific gravity of at least 1.30.

Due to the thermoplastic nature of the lignin, it is important that the panels be cooled to somewhat below the boiling point of water while under the full pressing pressure before they are withdrawn.

Side Restraint. When staypak is made from parallel-laminated veneer or from solid wood in thicknesses of 1/2 in. or more there is a tendency for the wood to spread in the across-the-fiber direction under pressure. When no side restraint is applied, the spreading of the panels is sufficient to reduce appreciably the specific gravity of the product near the edges. This same difficulty is encountered in the manufacture of compreg. Some form of side restraint should be used in making parallel-laminated staypak. This restraint can be provided by using a mold with stiff sturdy sides capable of withstanding a side thrust of at least 500 psi.

When a relatively few panels of each size and thickness are to be made, it will not pay to have a mold made for this purpose. Blocks of wood or packs of veneer strips approximately equal in thickness to the original wood, placed snugly along the fiber-direction edges of the panel assembly, will furnish the necessary restraint when pressure is applied. It is necessary that the veneer packs or blocks have their end grain against the panel, for then the restraining material shows no tendency to spread in the same direction as the panels. Blocks need not be placed continuously along the edge of the panel to be pressed. Blocks 2 to 3 in. long in the fiber direction of the panel may be spaced 2 to 3 in. apart, thus applying an intermittent restraint along half the length of the panel. There is a slight spreading between restraining blocks, but this is not sufficient to reduce appreciably the specific gravity of the product along the edges of the panel.

Time of Pressing. It has been shown in Figs. 1 to 4, inclusive, that the stabilization time will vary with the stabilization temperature and the moisture content of the wood. The time that the center of the wood need be held at the optimum temperature will also vary with the thickness of the wood. Thick ma-

TABLE 2 PROPERTIES OF STAYPAK MADE FROM VENEERS OF FOUR SPECIES CONDITIONED AT THREE RELATIVE HUMIDITIES[a]

Species	Veneer conditioned at rel. hum., per cent	Final pressing temp., deg F	Average specific gravity	Final pressing pressure, psi	Water absorption, per cent	Shrinkage in thickness from 90 to 30 per cent rel. hum., per cent	Recovery in thickness, per cent	Static bending: Fiber stress, psi	Static bending: Mod. of rupture, psi	Static bending: Mod. of elasticity, 1000 psi	Compression parallel to fibers: Fiber stress, psi	Compression parallel to fibers: Maximum, psi	Compression parallel to fibers: Mod. of elasticity, 1000 psi	Forest Prod. Lab. block-shear test for glue lines: Parallel to plies, psi	Forest Prod. Lab. block-shear test for glue lines: Perpendicular to plies, psi	A.A.F.[b] shear perpendicular to plies, psi	Izod Impact tests made by: Forest Prod. Lab., notched toughness, in-lb	Izod Impact tests made by: Forest Prod. Lab., ft-lb per in.	Izod Impact tests made by: Bakelite Corp., ft-lb per in.
Sugar maple	30	350	1.35	1800 to 2100	6.0	6.3	16.9	21040	40970	4044	14580	22950	3901	4568	7398	7600	130.2	10.6	10.4
	50	345	1.35	1600 to 2200	5.9	6.1	11.7	19730	37680	3984	12210	19980	3763	4094	7404	7050	121.2	9.3	10.9
	65	340	1.36	1400 to 2200	4.8	5.9	5.7	18920	35690	3789	10180	17940	3750	3811	6353	7880	117.2	10.8	10.1
Yellow birch	30	350	1.37	1800 to 2200	4.6	5.9	8.1	24040	42790	4740	14260	22860	4043	3632	6322	6890	129.3	11.4	10.6
	50	345	1.38	1800	3.1	5.4	6.4	21340	42670	4710	12750	21350	4136	3502	5322	7240	123.9	10.5	10.7
	65	340	1.36	1600 to 2200	3.4	5.5	5.0	18980	36720	4080	10690	17980	3732	2700	5063	6940	117.6	11.1	11.6
Sweetgum	30	350	1.33	1800 to 2200	4.7	5.7	10.3	19890	37120	3707	10830	20790	3555	2578	5354	6280	123.2	10.4	10.0
	50	345	1.30	1600 to 1800	5.2	5.3	5.1	16760	30580	3180	9700	18680	3075	2464	5913	6240	114.1	10.8	9.7
	65	340	1.35	1600 to 2000	5.3	5.5	9.6	19720	36740	3955	10090	19530	3590	2411	4203	5920	146.1	11.5	11.2
Cottonwood	30	350	1.37	1600	4.0	5.6	13.0	22650	34890	4420	11730	21340	4114	2192	5287	5080	146.0	13.3	10.9
	50	345	1.38	1400 to 1600	4.4	5.7	6.9	20130	35940	4532	11170	19870	3826	1830	4823	5260	140.1	12.3	10.6
	65	340	1.37	1200 to 1800	4.2	5.9	7.1	18710	32400	4184	10280	18730	3647	2051	4997	5620	144.1	14.0	11.8

[a] Panel thickness approximately 0.6 in. Time of heating at maximum temperature, 20 min. Each value represents the average for two specimens cut from each of four panels.

[b] Army Air Forces double shear test on cylindrical specimens (ref. 1). Test made by Bakelite Corporation.

terial, such as $1^1/_4$-in. panels, will require a longer time to heat and to cool than $^7/_8$-in. panels, thus the center of the thicker material need not be held quite so long at the optimum temperature. Table 3 gives the time required to make 53 × 14-in.

TABLE 3 TIME FOR MAKING 53 × 14-IN. PANELS OF YELLOW BIRCH STAYPAK OF TWO DIFFERENT THICKNESSES FROM VENEER CONDITIONED AT 50 PER CENT RELATIVE HUMIDITY

Operations	Time: $^7/_8$ in. thick, min	Time: $1^1/_4$ in. thick, min
Heating platens	15	15
Heating center of wood to 335 F	30	70
Holding temperature at 335 F	15	10
Cooling to 85 F	25	45
Total	85	140

panels of birch staypak in two thicknesses from veneer conditioned at 50 per cent relative humidity. The time required for heating and cooling the $^7/_8$-in. staypak should be half that for the $1^1/_4$-in. staypak on the basis of the time varying as the square of the thickness. This was found to be approximately true.

Type and Species of Wood. The thickness of the veneer used has a negligible effect upon the properties of staypak. It is preferable from a manufacturing standpoint to use $^1/_8$-in. veneer or even thicker when parallel-laminated products are sought because of the saving in handling costs and in glue. Staypak has been successfully made from solid wood. This material, which contains no synthetic resin, is comparable in properties with the parallel-laminated staypak made from veneer, showing that glue lines of synthetic resin do not improve the properties of the product.

Tests were made to determine if cross-banded staypak can be made from preformed plywood. Matched panels of preformed plywood and plywood made up at the time of compressing and stabilizing, using a hot-setting phenolic glue, gave similar shear values in the plane of the plies indicating that no injury to the preformed synthetic-resin-glue lines occurs under the conditions for making staypak. Similar panels made with casein glue gave poor shear strengths in the preformed glue lines indicating that they will not stand the conditions for making staypak. Casein glue can, however, be used in making staypak from veneer when the glue is set at the time of compressing and stabilizing the wood.

Staypak can be made from a variety of species. It has been successfully made from veneer and solid wood of yellow birch, sugar maple, black walnut, and Sitka spruce, from veneer of yellow poplar, cottonwood, sweetgum, and Douglas fir, and from solid hickory, white oak, red elder, and white fir. Difficulty in stabilizing the product was encountered with solid Douglas fir and ponderosa pine. This appeared to be due to the natural resins of the wood. Contrary to the findings with other species, the stabilization was best at the ends of the specimens, presumably because the natural resins of the wood were squeezed out of the end grain. The fact that Douglas-fir veneer made satisfactory staypak while the solid wood did not was presumably due to the high-temperature drying of the veneer that caused volatilization of part of the natural resins and fixing of the remaining resins, thus reducing the interferences of natural resins with stabilization. The only limitation in the choice of species for making staypak, according to the present procedure, seems to be avoiding the use of resinous, pitchy, solid wood.

It is surprising that oak, with its high acidity, was suitable for making staypak. Evidently the tendency for hydrolysis to take place under the manufacturing conditions is not great.

When staypak is made of solid wood it should be made from flat-grain stock free from knots that are the full thickness of the wood. Summerwood will not compress to as great an extent as will springwood because of its high specific gravity. The summerwood rings will not compress to the degree that the wood as a whole will compress, and hence they will buckle and distort badly when quarter-sawn boards are used, giving an unhomogeneous product. Knots have a considerably higher specific gravity than the normal wood and will take most of the load in compressing due to their lower compressibility. The knots will therefore tend to spread and crack the board. They are further liable to overstress the press.

STRENGTH PROPERTIES

The strength properties of staypak are considerably higher than those of the normal wood from which it is made, the strength increases being about in direct proportion to the compression (Table 2). The tensile strength, modulus of rupture, and modulus of elasticity in bending are significantly greater than for compreg of the same specific gravity. This is due to the fact that resin contributes to the weight and volume but not to these particular strength properties. Compreg, however, has a slightly higher compressive strength than staypak, owing to the fact that resin does contribute to this property to a greater extent than to the increase in weight and volume.

The chief advantage of staypak over adequately stabilized compreg is its superior impact strength. Staypak, in general, has twice the Izod values of compreg. The break across the specimen is fibrous in contrast to the granular break of compreg, indicating a lack of embrittlement in the staypak (Fig. 8).

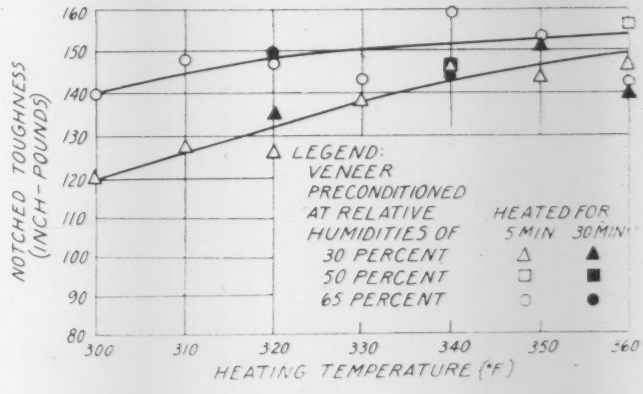


FIG. 5 EFFECT OF THE RELATIVE HUMIDITY AT WHICH THE VENEER WAS CONDITIONED, THE FINAL HEATING TEMPERATURE, AND THE TIME UPON THE NOTCHED TOUGHNESS OF PARALLEL-LAMINATED YELLOW-POPLAR STAYPAK PRESSED AT 2000 PSI

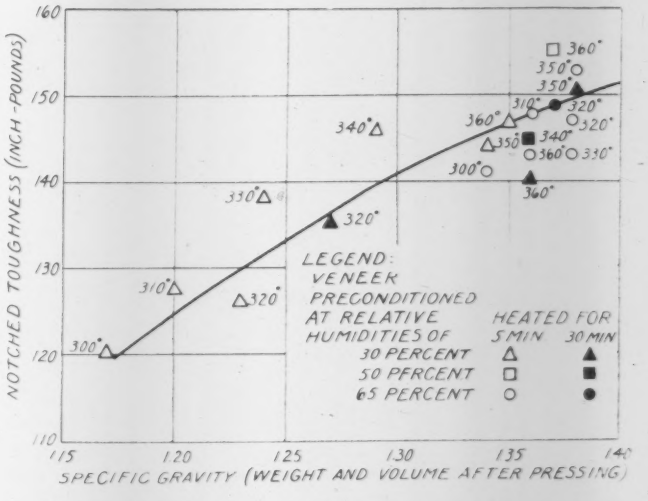


FIG. 6 DATA OF FIG. 5 PLOTTED TO SHOW THAT DIFFERENCES IN NOTCHED TOUGHNESS FOR PANELS MADE FROM VENEER CONDITIONED AT DIFFERENT RELATIVE HUMIDITIES ARE DUE TO DIFFERENCES IN THE SPECIFIC GRAVITY TO WHICH THE WOOD IS COMPRESSED

TABLE 4 EFFECT OF TEMPERATURE AND TIME OF HEATING IN MAKING YELLOW-BIRCH STAYPAK UPON SHEAR STRENGTH PARALLEL TO GRAIN AND IN PLANE PERPENDICULAR TO DIRECTION OF COMPRESSION

		Shear									
Curing temp., deg F	Curing time, min	Edge block,[a] psi	Block next to edge,[a] psi	Block next to center,[a] psi	Center block,[a] psi	Near top of blocks,[b] psi	Center of blocks,[b] psi	Near bottom of blocks,[b] psi	Average, psi	Minimum, psi	Maximum, psi
Compressed to Specific Gravity 1.36 to 1.38											
300	5	3048	2776	2603	2651	2845	2637	2693	2725	2308	3270
300	15	3029	3311	3168	2866	2842	3421	2911	3058	2282	3548
315	15	2762	3011	2625	2471	2966	2865	2320	2717	2075	3310
330	15	3050	3287	3220	2724	2970	3210	3138	3106	2767	3387
345	15	3048	3047	2987	2473	3131	3057	2613	2933	2448	3495
								Grand average	2908		
Uncompressed Control											
300	15	2240	2148	2095	2119	2639	2011	1802	2151	1633	2712

[a] Each value is the average of three tests made at center and near each face of the blocks.
[b] Each value is the average of four tests made on blocks from the four positions from edge to center of the panel.

Figs. 5 and 6 show the notched-toughness values for the specimens of yellow-poplar staypak of Figs. 1 to 4, inclusive. Fig. 5 shows that staypak made from veneer in equilibrium with high relative humidity has somewhat higher notched-toughness values than the material made from veneer in equilibrium with lower relative humidity. This is due to the increased plasticization caused by increased moisture content, which results in an increased specific gravity under a fixed pressing pressure, as is shown by Figs. 1 and 6.

Izod impact values vary considerably less with specific gravity than do the notched-toughness values. It has been shown prior to this time (8) that at the highest specific gravities the notched-toughness values should be divided by 11.0 to convert to Izod values in foot-pounds per inch of notch, while at normal wood specific gravities the notched-toughness values should be divided by 6. The data indicate that both the notched-toughness and the Izod values of compressed wood are independent of the degree of stability imparted to the product prior to any recovery of the unstabilized specimens.

The shear strength parallel to the grain and in a plane perpendicular to the direction of compression of the wood (in the plane of the plies when veneer is used) is appreciably lower for staypak than for compreg. Any fibers that are ruptured during the pressing of compreg are rebonded with the resin within the plies. In staypak there is no resin present to do this. Unlike most properties, which do not seem to vary appreciably between species, the shear in the plane of the plies varies at least twofold between the species tested (Table 2). A series of tests of

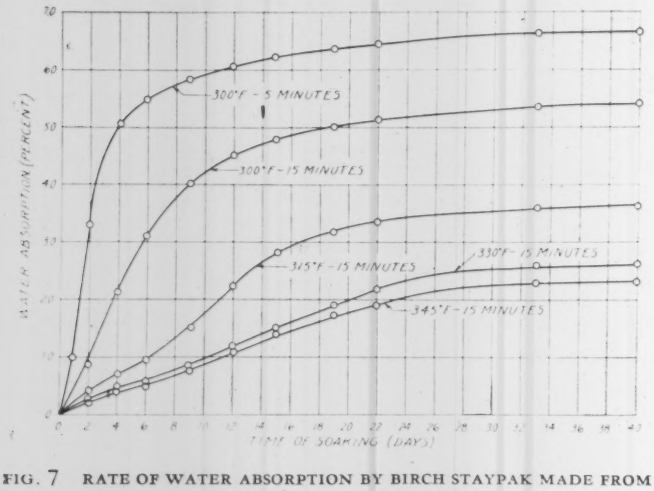


FIG. 7 RATE OF WATER ABSORPTION BY BIRCH STAYPAK MADE FROM VENEER CONDITIONED AT 50 PER CENT RELATIVE HUMIDITY AND PRESSED UNDER DIFFERENT STABILIZING CONDITIONS

(The stabilizing time is the time that the center of the specimen is held at the optimum heating temperature. The specimens were 1 × 0.75 × 3 in., the 1-in. dimension being in the fiber direction.)

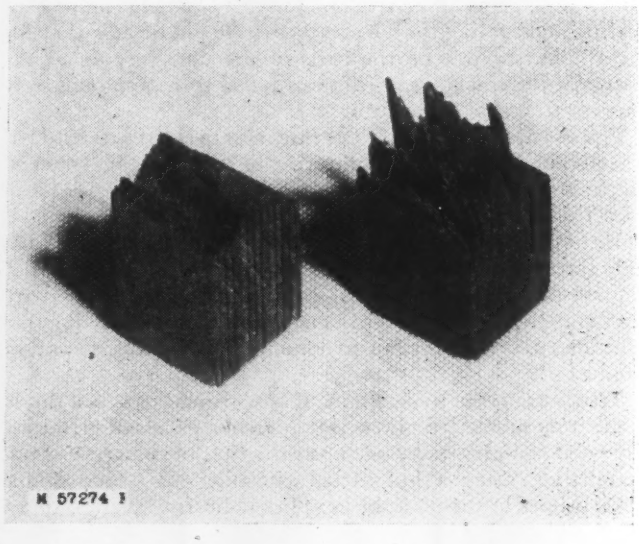


FIG. 8 COMPARISON BETWEEN THE IZOD IMPACT BREAKS OF COMPREG (LEFT) AND STAYPAK (RIGHT)

the double cylindrical shear (1) parallel to the grain and in a plane perpendicular to the direction of compression gave average values of 3700 psi and 3400 psi for birch staypak (specific gravity 1.37), using $^3/_8$-in- and $^1/_2$-in-diameter specimens, and 4500 psi and 3900 psi for maple staypak (specific gravity 1.35) using $^3/_8$-in- and $^1/_2$-in-diameter specimens. Where shear in the plane of the plies is important staypak made from maple or birch should be used. Where this shear value is not of great importance, the staypak can be made from more readily available species.

A series of panels was prepared to determine if the high temperature to which the wood is heated in making staypak has any effect upon the shear in the plane of the plies. The data are given in Table 4, segregated as to the position of the shear block in the panel and the position in the thickness direction of the blocks at which the shear tests were made. The fact that there is no consistent variation with temperature indicates that the lower shear strength of staypak as compared with compreg is due to the absence of resin within the plies rather than to the unusually high temperature of the process. The corresponding shear strengths for an uncompressed matched panel are also given in Table 4. The shear strengths of the compressed staypak are all higher than for the uncompressed controls, even though they are not quite so high as for compreg.

Maple staypak made from veneer conditioned at 30, 50, and 65 per cent relative humidity (Table 2) will meet all the Army Air Forces strength requirements for compreg (1) over the complete range of stabilization conditions tested. Birch, gum,

and cottonwood staypak will meet all the strength requirements except the shear strength in the plane of the plies. In this property birch staypak will give borderline values, while gum and cottonwood will give values somewhat below the specified values.

GLUING STAYPAK—ATTACK BY TERMITES

Preliminary gluing tests indicate that staypak can be glued to itself or to normal wood more readily than can compreg. Good joints were obtained with various hot- and cold-setting urea and phenolic glues.

Although good glue joints giving 100 per cent wood failure can be obtained with small blocks that have not been surfaced, large thick panels are seldom sufficiently flat to give very good glue joints. A means of making the surfaces plane for gluing by scraping them with a special knife has been developed.

Preliminary termite exposure tests of birch staypak under severe outdoor conditions for six months indicate that staypak shows little if any resistance to attack and is considerably inferior to compreg in this respect.

POTENTIAL USES OF STAYPAK

Staypak should have many uses, for it has an Izod impact strength about twice that of stabilized compreg and appreciably greater than that of unstabilized compreg. Consequently, it should be less susceptible to concentration of stresses. It has a greater stability than most of the high-impact-strength compregs, and it is potentially cheaper to produce. Propeller blanks are now being prepared of staypak at the Forest Products Laboratory and test airplane propellers will be carved to determine its suitability to replace compreg. Because staypak is less notch sensitive than compreg it should be more suitable for spar plates and various fittings. It should also be suitable for tool handles, mallet heads, pulleys, silent gears, and various tooling jigs and dies. Because of its greater swelling than that of compreg, staypak will not be so suitable for water-lubricated bearings or other underwater uses.

SUMMARY

Solid flat-sawn nonresinous wood and veneer spread with glue and assembled in parallel-laminated or cross-banded form can be compressed to a high-specific-gravity product that does not tend to spring back under moisture-absorbing conditions when it is pressed under conditions that cause some flow of the lignin. The conditions for making this material, called staypak, and its chief physical properties have been determined. It is shown to have several strength properties superior to compreg, most notable of which is its greater impact strength. Although it is not as dimensionally stable as compreg, it is sufficiently stable for many uses.

BIBLIOGARPHY

1 Army Air Force Specification, Wood: Impregnated Compressed, No. 15065, June 10, 1942. Revised No. 15065A, March 15, 1944.
2 "Superpressed Plywood," by R. K. Bernhard, T. D. Perry, and E. G. Stern, MECHANICAL ENGINEERING, vol. 62, 1940, p. 189.
3 Forest Products Laboratory Mimeo. 1384, by H. K. Burr and A. J. Stamm, January, 1943.
4 U. S. Patent No. 1,952,664, Gustavus J. Esselen, 1934.
5 "High-Density Plywood," by Malcolm Finlayson, Transactions, The American Society of Mechanical Engineers, April, 1943, p. 193.
6 *Australian Timber Journal*, article by A. L. Gunn, 6 (3): 143, 1940.
7 "Technologie des Holzes," by F. Kollman, Julius Springer, Berlin, Germany, 1936.
8 Forest Products Laboratory Mimeo. 1386 by M. A. Millett, R. M. Seborg, and A. J. Stamm, May, 1943.
9 U. S. Patent No. 1,707,135, L. J. Olesheimer, 1929.
10 U. S. Patent No. 1,981,567, A. G. Olsen, 1934.
11 U. S. Patent No. 646,547, C. U. Sears, 1900.
12 "The Compression of Wood," by R. M. Seborg and A. J. Stamm, MECHANICAL ENGINEERING, vol. 63, 1941, p. 211.
13 "Resin-Treated, Laminated, Compressed Wood," by A. J. Stamm and R. M. Seborg, Transactions, American Institute of Chemical Engineers, vol. 37, 1941, p. 385.
14 Forest Products Laboratory Mimeo. 1381 by A. J. Stamm and R. M. Seborg, January, 1942.
15 U. S. Patent No. 1,465,383, F. L. Walsh and R. L. Watts, 1923.

Upper Management in Training

(Continued from page 22)

To meet new and changing situations, new material is constantly being made available through a design and development procedure which has been set up to insure that the material as it is developed represents the combined judgment and experience of those men in closest touch with the problem and in the best position to determine how the need can be met most effectively. It is in this area, too, that the upper levels of management participate in the development of those materials needed for their own development as well as that of their organization.

In the minds of the operating managers, training is simply one of the methods to be used in reaching their organizational objectives. However, participation of upper management in the team training of all levels within this mechanism through which they operate brings them to the full realization that training includes far more than formal programs conducted under group methods. A major portion of the training within their organizations, aimed at the objective not only of increased effectiveness of the operation but also of giving the individuals experience that will make them well-rounded men, is accomplished in the day-to-day contact between the members of their executive organization.

One of our practical plant managers said some years ago, "It has taken me twenty-five years to gain the knowledge and ability to make a success of this job. If I were starting in the same general way in the more complex industry of today, it would probably take fifty. It should be possible by well-organized methods to do it in much shorter time—possibly in five or ten years."

POSTWAR PROBLEMS DEMAND CAPABLE MANAGEMENT

In our experience over a period of 25 years, we of the Institute have had an opportunity to become acquainted with those in upper management broadly and personally as men. From these rather intimate contacts, we have gained a sincere respect for management and a point of view that might be summarized as follows:

1 Upon the effectiveness of individuals within the industrial structure depends the very existence of a postwar world of the type for which we are fighting.

2 The effectiveness of individuals within the industrial organization will depend entirely upon the effectiveness of the processes of personnel development within and outside industry. There is no known way of operating an organization without training and without trained men.

3 Training itself is an inherent part of the operation of an industrial organization, and having a well-trained organization and maintaining its effective functioning becomes of ever-increasing importance to the executive in meeting the objectives and responsibilities of his job as we go higher in the levels of the executive organization.

4 The problems that we will meet in the postwar world are going to be some of the most difficult that any generation has ever faced. Those problems will have to be solved by men who have been exposed to a broad experience and so are balanced and well-rounded individuals. To the extent that individuals in industry, in addition to sound technical knowledge and highly developed technical skills, also have a breadth of vision, imagination, and understanding of human values and human organizations, to that extent will they be able to solve the intricate social and organizational problems that will confront us. We will achieve a better world in the postwar tomorrow to the extent that those in upper management, responsible for personnel development, are able to build better men and women today.

POSTWAR FEDERAL TAXES[1]

By RALPH E. FREEMAN

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

THE Committee for Economic Development, as part of its program of research, has worked out a novel method of promoting co-operation between businessmen and scholars. The supervision of this program is vested in a Research Committee composed entirely of the representatives of industry, assisted by an Advisory Board made up of distinguished social scientists. The actual research is conducted by a staff of economists and other specialists, who are free to express their own ideas and arrive at their own conclusions. After the completion and publication of each study, the Research Committee issues a statement of policy. Though the businessmen on this Committee have the benefit of the findings of its research staff, the policy statement is their product and their responsibility. In this way the views of the economist and the businessman are blended. Each makes his distinctive contribution—one a research study, the other a policy statement—and in the preparatory stages there is much debate, criticism, and interchange of ideas. From all accounts the results have been highly satisfactory.

One of the first research studies to be published was entitled, "Production, Jobs, and Taxes."[2] This study has been widely read. It contains recommendations for recasting the postwar federal revenue system in the interest of high production and employment. It discusses the major issues involved and gives consideration to the practical as well as to theoretical aspects of these issues. An attempt is made to develop an integrated program in which the various personal and business taxes stand in proper relation to each other.

Since the publication of this report, a policy statement has been issued which endorses most of the recommendations contained in the original research study. This outline of policy deals in the main with the same issues as are taken up in other proposals that have recently been made—such as the program of Beardsley Ruml and H. C. Sonne drawn up for the National Planing Association, and the Twin Cities Plan formulated by a group of businessmen in Minnesota. A brief comparison of these three programs will bring out the main features of the C.E.D. policy statement.

Ruml and Sonne propose the abolition of all Federal taxes on corporations—except for a 5 per cent franchise tax—and that three quarters of future revenue be raised from taxes on the incomes of individuals. The Twin Cities Plan calls for a sharp reduction in the rates on individual incomes, the loss in revenue to be made up by a 5 per cent retail sales tax with no exemptions. This plan proposes the removal of the excess-profits tax. No change is suggested in the ordinary rates (normal plus surtax).

The C.E.D. proposals differ in important respects from the two programs just mentioned. As to personal income taxes, the Committee takes a middle position. While relief will be given taxpayers at all levels of income (especially those near the bottom and top of the scale), it proposes that the personal income tax should provide at least half the total Federal taxes collected. Ordinary corporate income taxes should be cut to the minimum rate now levied on personal incomes, 16 to 20 per cent, and the excess profits tax should be removed. The C.E.D. is opposed to the sales tax of the Twin Cities Plan.

In supporting its position the C.E.D. points to three advantages inherent in the personal income tax as a method of raising revenue: (1) It has a less repressive effect on production and employment than do sales, excise, or corporation taxes, provided, however, the rates do not discourage the higher-income groups from taking risks nor unduly curtail the purchasing power of those in the lower brackets. (2) The personal income tax is the fairest form of taxation most closely adjustable to ability to pay. (3) It is clearly evident where the tax falls.

This third point is given special emphasis. "It is a common and mischievous fallacy about taxation that it is possible to relieve individuals of a tax burden by levying taxes on goods, on corporations, or on transactions. The truth is that all taxes have to be paid out of the pockets of living persons. The mere circumstance that in many cases the taxpayer may be unaware of the tax does not alter the fact that he is paying it." The Committee feels that it would be a healthy thing for all taxpayers to be acutely conscious they were contributing to the Federal Government.

Both the Twin Cities Plan and that of the C.E.D. assume a postwar level of Federal expenditures of about $18 billion. They agree that this sum can be raised by taxation even if the rates are lowered from their present levels. But to make this possible, employment and the national income must be maintained. The C.E.D. expects 55,000,000 people to be at work and a national income of $140 billion. The authors of the Twin Cities Plan refuse to forecast the postwar level of national income, but state that a national income of $120 billion would be adequate to support a Federal budget of $18 billion.

Both these plans stress the necessity of attaining a balanced budget, the latter taking the position that fiscal soundness does not mean "that there must never be a deficit at the end of a fiscal year. It does mean, however, that over a period of years aggregate income must balance the total outgo."

All plans for tax revision, whether coming from private groups, from the Administration, or from Congress, emphasize the necessity for stimulating production and employment after the war. They hold that taxes should be framed so as to avoid placing checks upon normal productive impulses and to encourage as much as possible the investment of venture capital and the assumption of business risks.

As has been intimated there is some difference of opinion as to the best way of providing the desired stimulus to investment. The thesis of the Twin Cities Plan is that relatively heavy corporate taxes are not as harmful to private enterprise as are heavy individual taxes. The other plans regard corporate taxation as the chief deterrent. The House Committee on Reconversion Planning, under the chairmanship of Representative Colmer, takes this view.

All groups are in favor of abolishing the excess-profits tax and the present double taxation of stockholders. The Twin Cities Plan recommends that 40 per cent of dividends received by individual stockholders be excluded from gross income. The C.E.D. program suggests that the entire corporate income tax be treated as a tax on individual stockholders collected at the source. The tax on corporate earnings would be a kind of pay-as-you-go levy similar to that now collected from business on wages and salaries.

The publication and discussion of these various plans have helped to create a strong public opinion in favor of a fundamental revision of Federal taxation, and there is reason to be-

(*Continued on page 69*)

[1] One of a series of reviews of current economic literature affecting engineering, prepared by members of the Department of Economics and Social Science, Massachusetts Institute of Technology, at the request of the Management Division of The American Society of Mechanical Engineers. Opinions expressed are those of the reviewer.

[2] "Production, Jobs, and Taxes," Harold M. Groves McGraw-Hill Book Co., Inc., New York, N. Y., 1944.

Dependence on STRESS *of* DAMPING CAPACITY *of* ALLOYS

By ANDREW GEMANT

THE DETROIT EDISON COMPANY, DETROIT, MICH.

PRINCIPLE OF INVESTIGATION

THIS paper, the purpose of which is essentially a practical one, is concerned with the stress dependence of the damping capacity of alloys. In a previous paper (1),[1] the author dealt with reduction of machinery vibrations by the use of materials having high damping capacity. Considerations of this kind are important in the construction of internal-combustion engines, turbine blades, and airplane elements such as propellers. It was shown that it is not necessary to use a material having a high damping capacity over a wide range of stress; it is sufficient if it has high damping capacity at high stresses. Moreover, on the basis of physical considerations, it was shown that, in order to retain high mechanical strength, the latter type of material is even preferable to one of high over-all damping capacity.

In this paper, data from the literature will be reviewed and examined to determine whether any of the presently available alloys fulfill the given requirement to any degree. In addition, some tentative conclusions will be drawn as to the necessary alloying elements required to produce the desired properties.

Damping data on alloys can be reviewed by plotting the experimentally obtainable logarithmic decrement δ as a function of stress S, and examining the various curves obtained. An alternative procedure will be suggested, which consists in converting the decrement into a quantity to be explained, called "transient flow resistance;" and then plotting this quantity against the stress. The resulting curves may be examined from the special standpoint under consideration. The mathematical procedure involved in the conversion is simple, and the method has the advantage of permitting a physically visualizable interpretation of the constants involved.

At this point of the discussion, it will be useful to explain briefly the basis for a conversion of the logarithmic decrement to the quantity called transient flow resistance. Simultaneously it will be shown that there is a correlation between creep and damping, a relation of which use will be made in this investigation.

Damping is caused chiefly by two mechanisms, one being the plastic flow of the material, the other an irreversible thermal process. The ratio of the contributions of these two causes varies according to conditions, but it appears that in a large number of cases the first is of major importance.

Considering only this mechanism, damping is caused by the alternating plastic flow that takes place during vibration. However, the steady-state flow resistance η is much too great (its order of magnitude, as will be seen in the next section "Creep of Alloys," is 10^{18} poise) to account for logarithmic decrements of 10^{-3} to 10^{-2}, as observed. An explanation of this discrepancy, as suggested by the writer (2), is the known fact that the rate of plastic displacement immediately after applying a stress is considerable, and only after a small but finite time interval does it resume the low rate associated with the steady-state flow. Hence the flow resistance is considerably less than η in the very first period after applying the stress.

A plastic displacement of this type, usually observed in experiments, can be explained by assuming that a certain part of the elastic deformation of any material is opposed by frictional forces. These are not the same as those which have to be overcome during the final steady-state flow. The simplest (an approximate) way of depicting such a mechanism is the diagram shown in Fig. 1. Here A and B are the two end points at which an external force, say a tensile stress, acts upon a body. On the left side are shown the elements opposing flow, on the right side the elements opposing elastic displacements. The connecting lines between elements are rigid. The dashpot η is the steady-state flow resistance, which opposes creep. The spring E is the cause of the reversible elasticity of the material (E = elastic modulus). A second spring E^*, much softer than E, is in series with the latter and represents an imperfect elasticity. Its motion is impeded by the parallel dashpot η^* which may be called the transient flow resistance. When a stress is applied, E is first instantaneously displaced. Displacement of E^* follows exponentially because of the influence of the dashpot η^*. Last, the steady displacement of η (creep) prevails. Such a mechanism also follows from a detailed physical picture of flow on the basis of intermolecular forces, as first shown by Prandtl. Both E^* and η^* can be determined from creep curves that start at not more than about 10 msec after applying the stress, as the author has shown (2).

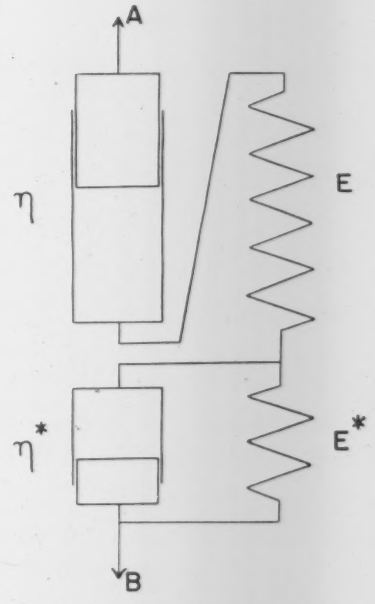


FIG. 1 DIAGRAM EXPLAINING CORRELATION BETWEEN CREEP AND DAMPING CAPACITY

The resistance η^* is connected with the logarithmic decrement in a complicated manner, the relation, however, assuming a simple approximate form for frequencies above the reciprocal of the so-called time-constant, η^*/E^*, of the spring E^*. The frequencies usually encountered in practice generally fulfill this condition. The approximate relation for this case is

$$\delta = \frac{E}{2\nu\eta^*} \qquad [1]$$

where ν is the frequency of the vibration. This relation holds for all stresses; δ depends on stress because η^* depends on it.

It is seen that δ is determined by the transient, not the steady-state, resistance. An order of magnitude of 10^{12} to 10^{14} poise can be derived for η^*, using experimental data for δ, as will be shown in the section, "Damping of Alloys."

As can be seen, creep and damping are treated here from a uni-

[1] Numbers in parentheses refer to the Bibliography at the end of the paper.

fied point of view, the chief difference being that, while creep is considered as determined by the steady-state component of the flow resistance, damping is determined by the transient component of the flow resistance. Thus, a damping capacity that is characterized by becoming appreciable at high stresses corresponds to a transient flow resistance that falls sharply with increasing stress. Similarly, a creep rate that increases considerably with stress corresponds to a steady-state flow resistance which drops sharply with increasing stress.

It is not maintained that damping and creep are simultaneously stress-dependent or stress-independent in a given material. However, if the two are linked together, then there is some probability of a stress-dependent creep and damping occurring together. An alloying element present in the metal will probably affect both η and η^* in a similar manner. Direct experimental evidence supporting this statement, as applied to various alloys, is missing as yet.

Although there is a substantial literature on the stress dependence of creep, and even quite recently several contributions (3, 4, 5, 6) have appeared on the subject, a review of some creep data will make the subsequent review of damping data clearer and more understandable, as well as illustrate the physical correlation between creep and damping.

CREEP OF ALLOYS

The creep data on alloys analyzed in this section were taken from the compilation of the A.S.M.E. and A.S.T.M. (7), and from data on lead obtained by Moore (8). The selection of the data presented was guided by the special consideration discussed in the introductory section.

In order to allow a physical interpretation of creep data, it is best to convert the rate of elongation into the flow resistance as previously explained. The latter is analogous to the concept of viscosity, but this name is better reserved for cases of little or no stress dependence. However, the flow resistance is denoted by η, the symbol usually used for the viscosity. If the rate of elongation is de/dt and the stress is S, then

$$\eta = \frac{1}{3} S/(de/dt) \quad [2]$$

In the following η is always given in poises.

The most generally accepted physical theory of the plastic flow of metals is probably the dislocation theory of Taylor, Polanyi, and others, as discussed, among others, by Seitz (9). While this theory explains many features, particularly those related to slip, it has not yet been successfully employed in the quantitative treatment of creep, i.e., the steady-state flow. The dislocation theory is concerned chiefly with the crystallographic aspects of flow, hence its popularity, but it does not contain inherently the concepts of time and rate. When the major interest is in the creep process, it is better to operate on the basis of a theory into which statistical aspects are introduced. This was done by Becker, Orowan, and most completely by Eyring and associates (10). Also, in the work of Dushman (5), the same theory is utilized.

Only the dependence of creep on stress is of interest in this particular study. It is possible to write the theoretically obtainable equation for the flow resistance in the form

$$\eta = \eta_0 bS/\sinh(bS) \quad [3]$$

This equation implies that for sufficiently small stresses, characterized by

$$bS < 1 \quad [4]$$

the resistance has the constant initial value η_0. For higher stresses the resistance drops rapidly. It should be pointed out that the theoretical relation expressed by Equation [3] usually holds only up to stresses of from 5000 to about 10,000 psi, the lower figure referring to damping and the higher one to creep. For stresses higher than this, the flow resistance does not drop as sharply as required by Equation [3]. It is evident that secondary processes, not considered in the theory, partly compensate for the rapid drop required by Equation [3].

The constant b is a measure of the stress sensitivity of creep. While η_0 is a measure of the initial creep resistance, b measures its decrease with increasing stress. From the standpoint of the requirements for reducing machinery vibrations (1) and the discussion given under "Principle of Investigation," it is desirable that the materials used have a high η_0 value as well as a high b value. The examination will be directed toward determining whether it is possible to find alloys that fulfill this dual condition. Obviously the requirement of a high b value is more important than that of a high η_0 value. Actually the combination of a low η_0 and a high b will produce the lowest creep resistance at high stresses, but such a material would probably not have the necessary over-all hardness and strength.

The constant η_0 of Equation [3] contains, according to Eyring's theory, various factors. The main idea of this theory is that flow takes place in the form of individual "jumps" of certain "units of flow." The larger the energy of activation necessary for a successful jump, the higher the flow resistance.

The influence of stress results from the fact that the energy of activation in the presence of an external force is lowered by the amount of the work done by the force in moving the unit of flow. This work will be larger the larger the unit of flow. Theory shows that

$$b = \frac{a\lambda}{2kT} \quad [5]$$

where a = cross-sectional area of unit of flow, λ = path of unit of flow during one jump, k = Boltzmann constant, T = temperature in degrees K. The product $a\lambda$ is a volume, to be denoted by v, and is of the order of the volume of the unit of flow. Hence a set of experimental data, if reproduced by Equation [3], will yield the quantities η_0, b, and v, the last one being deducible from b.

Calculation of the three characteristic constants was carried out for a number of alloys and the results given in Tables 1, 2, and 3, referring, respectively, to iron, copper, and lead alloys. Since the theory of Eyring has only a restricted applicability to metals, as previously pointed out, comparison of values for η_0 and v for widely differing cases is probably not justified. The comparison will therefore be restricted to groups of similar alloys, tested at the same (or at least not too different) temperatures. By suitable spacing, the tables are divided into narrower groups of similar alloys, and comparison of the constants will be restricted to alloys within a group. The tables contain the name of the alloy, percentage composition, temperature in degrees F, η_0 in poises, b in absolute units, and v in cm^3. In discussing the results given in the tables, use will be made of v rather than b because the former has simpler physical significance.

The first group of the iron-carbon alloys (Table 1) contains two molybdenum steels, the η versus S relation of which is shown in Fig. 2. The curves in this figure were calculated using Equation [3] with suitable constants; the points are experimental. In plotting these, as well as other η versus S curves presented in this paper, use was necessarily made of two of the experimental points in evaluating the constants of Equation [3] and determining the shape of the curve. Experimental points in excess of two afford a verification of the equation. The curves are drawn dotted because the equation is only approximate, and because the two experimental points used in determining the constants were selected arbitrarily.

Both a comparison of values for η_0 and v and a study of the two curves show that the second alloy listed in the table has the more desirable characteristic. In the second group (Cr-Mo steels) the first has the larger v, although a lower η_0. In the third group (Cr-Ni steels) the second and third are superior to

TABLE 1 CREEP CHARACTERISTICS OF STEEL ALLOYS

Type of steel	Data on chemical composition		Test temperature, deg F	η_0, poises	b, abs	v, cm³
Wrought C—0.50 Mo steel	0.16 C, 0.30 Si	0.49 Mn, 0.49 Mo	1200	0.17×10^{18}	17×10^{-9}	4.2×10^{-21}
Wrought C—0.50 Mo Steel	0.11 C, 1.35 Si	0.19 Mn, 0.50 Mo	1200	0.61	25	6.4
Wrought 4–6 Cr, 0.50 Mo steel	0.10 C, 4.83 Cr	1.55 Si, 0.51 Mo	1200	0.17	18	4.6
Wrought 4–6 Cr, 0.50 Mo steel	0.10 C, 5.09 Cr	0.18 Si, 0.55 Mo	1200	0.70	14	3.6
Wrought 18 Cr + 8 Ni steel	0.09 C, 0.28 Si, 17.7 Cr, 8.4 Ni	0.32 Mn	1200	0.60	3.7	0.95
Wrought 18 Cr + 8 Ni steel	0.06 C, 0.61 Si, 17.7 Cr, 9.2 Ni	0.50 Mn	1200	6.6	7.5	1.9
Wrought 18 Cr + 8 Ni steel	0.12 C, 0.58 Si, 18.5 Cr, 9.7 Ni	0.47 Mn	1200	22	7.8	2.0
Wrought Ni + Cr + Mo steel	0.39 C, 0.27 Si, 0.72 Cr	1.74 Ni, 0.32 Mo	1000	0.12	3.5	0.78
Wrought Ni + Cr + Mo steel	0.42 C, 0.18 Si, 0.87 Cr	2.12 Ni, 0.19 Mo	1000	1.4	3.7	0.83

TABLE 2 CREEP CHARACTERISTICS OF COPPER ALLOYS

Type of alloy	Data on chemical composition		Test temperature, deg F	η_0, poises	b, abs	v, cm³
Wrought copper alloy	59.9 Cu, 0.7 Sn	39.2 Zn	400	1.5×10^{18}	4.4×10^{-9}	0.58×10^{-21}
Wrought copper alloy	95.6 Cu, 1.2 Mn	2.8 Si	400	14	4.4	0.58
Wrought copper alloy	94.2 Cu	5.5 Sn	930	0.07	3.6	0.77
Wrought copper alloy	95.3 Cu, 1.2 Mn	3.4 Si	800	0.16	26.0	5.0
Wrought copper alloy	74.2 Cu, 20.0 Ni	5.1 Zn	750	28	6.0	1.1
Cast copper alloy	85.5 Cu, 5.5 Sn	4.4 Zn, 4.2 Pb	500	0.15	2.3	0.34
Cast copper alloy	87.1 Cu, 6.2 Sn	4.6 Zn, 1.8 Pb	500	>3.0	13	1.9

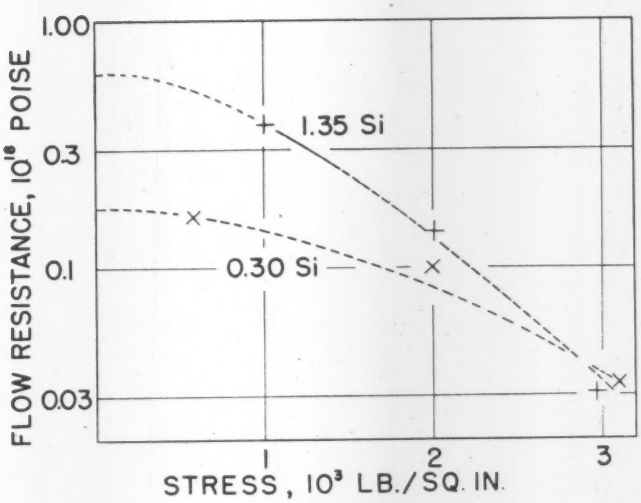


FIG. 2 FLOW RESISTANCE VERSUS STRESS AT 1200 F FOR TWO 0.5 MOLYBDENUM STEELS

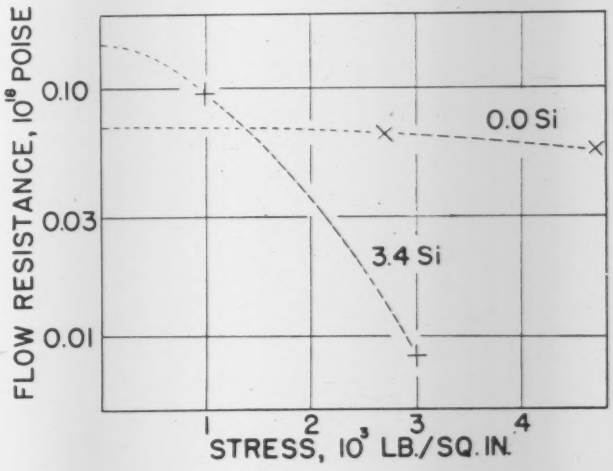


FIG. 3 FLOW RESISTANCE VERSUS STRESS AT 800 AND 930 F FOR TWO COPPER-BASE ALLOYS

the first, and in the last group (Ni-Cr-Mo steels) the second is slightly better than the first. Comparing the compositions, the conclusion can be drawn that, in the first three groups, the alloys with the higher silicon content are the more desirable. In the fourth group this rule does not hold, but the values of v differ only slightly. The more desirable alloy in this group has a higher nickel content, the same being true for the third group. It should be added that a more rigorous and systematic investigation of the type suggested in this paper will have to consider also the type of heat-treatment as an essential factor. The best procedure would be to keep the heat-treatment constant in samples having varying alloying elements and vice versa. A comparison of this kind was not possible with the available data at hand; for this reason only the influence of alloying is considered here.

Study of the data on copper alloys (Table 2) leads to similar conclusions. The first group shows two alloys with identical v values, but with η_0 values in a ratio nearly 1:10 in favor of the second alloy. While this has 2.8 per cent, Si the first has none. In the second group the second alloy is the highest with regard to v, but the third is the best with regard to η_0. The second contains 3.4 per cent Si, the third 20 per cent Ni, the first has

TABLE 3 CREEP CHARACTERISTICS OF LEAD AND LEAD ALLOYS

Type of lead	Data on chemical composition		Test temperature, deg F	η_0, poises	b, abs	v, cm^3
Grade II lead[a]	0.05 Cu	0.04 Bi	74	0.26×10^{18}	170×10^{-9}	14×10^{-21}
Grade II lead[a]	0.05 Cu	0.04 Bi	110	0.15	190	16
Grade II lead[a]	0.05 Cu	0.04 Bi	150	0.057	210	20
Grade III lead[a]	0.07 Bi		110	0.074	210	18
Calcium lead	0.03 Ca	0.05 Cu	78	1.5	300	25
Calcium lead	0.03 Ca	0.05 Cu	110	0.62	250	22
Calcium lead	0.03 Ca	0.05 Cu	150	0.28	210	20
Calcium lead	0.03 Ca	0.04 Cu	76	1.2	270	22
Calcium lead	0.03 Ca	0.04 Cu	150	0.39	300	28
Calcium lead	0.038 Ca		74	3.0	300	24

[a] A.S.T.M. standards.

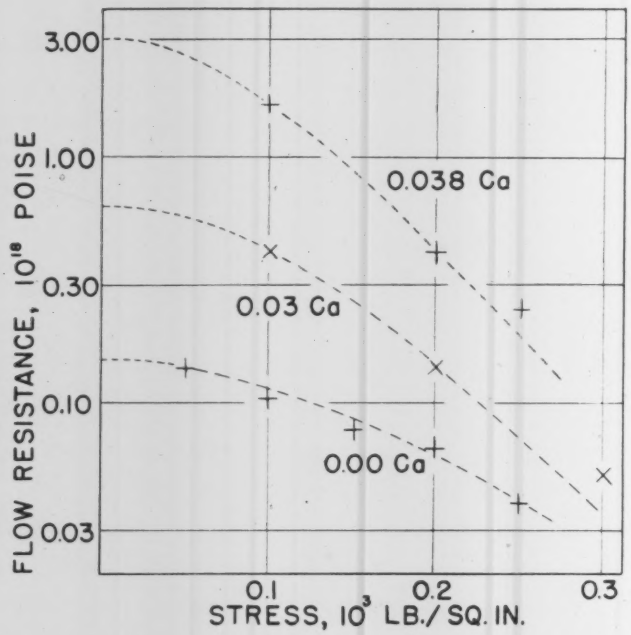


FIG. 4 FLOW RESISTANCE VERSUS STRESS AT 74 AND 110 F FOR LEAD AND CALCIUM LEAD

neither of these. A comparison of the first and second alloys in this group can also be made by studying Fig. 3, which shows the striking difference in behavior. The third group of Table 2 shows that the second alloy is superior, presumably as a result of the difference in lead content, lead being deleterious from the standpoint of creep resistance.

Table 3 contains data on lead and calcium lead. The latter shows higher values for both η_0 and v. Plotting η vs. S curves for three samples (Fig. 4), it is evident that both initial flow resistance and steepness of the curves increase with increasing calcium content.

Summarizing, it is found that by proper alloying it is possible to impart the desired characteristics, namely, high initial resistance, low resistance at high stresses. It may be noted that this feature is roughly equivalent to the practical requirement of hardness and toughness. In the terms used in this discussion, hardness is measurable by the quantity η_0, while toughness is measured by v.

It was emphasized that a particular advantage of describing the creep characteristics in the manner shown is that both η_0 and b (or v) are capable of a physical interpretation. An analysis of η_0 is outside the scope of this paper. The stress dependence, with which we are chiefly concerned, is measured by v, which indicates the size of the unit of flow. Assuming λ to be of molecular dimensions, the order of magnitude 10^{-21} cm^3 for v gives for a, the cross-sectional area, an order of 10^{-13} cm^2, that is, a linear dimension of 3×10^{-7} cm, the size of an aggregate of some 10 atoms per dimension.

It was observed that silicon in particular imparted steepness to the creep characteristic, indicated by large values of v. This would mean that silicon increases the size of the unit of flow. These units are, as shown, atomic aggregates, minute crystallites, considerably smaller than the microscopically observable grains.

In explaining the role of silicon, one may look into the behavior of various silicon compounds other than silicon alloys. Silicon, owing to its four valences, has a strong tendency to polymerize, as known from the structure of glasses and from the polymer liquids of silicon-oxyhalides (11). This property might explain by way of analogy that silicon as an alloying element will tend to increase the size of atomic aggregates that act as units of flow. In this manner the stress dependence becomes pronounced, and if an alloying element like nickel, which increases η_0, is also present, the resulting alloy will have the desired characteristic.

DAMPING OF ALLOYS

Having analyzed the creep characteristics of some alloys, the discussion on a similar basis of the damping capacity of alloys follows. Such an investigation must by necessity be rather limited, due to the scanty literature on the subject. Data of the earlier literature, say, before the fundamental researches of A. L. Kimball (12), are not very reliable. Even the recent literature suffers from the lack of systematic investigation. The author knows of only two papers that cover a sufficiently wide range of alloys; neither of which includes a sufficiently wide range of frequencies, however. There is definite need for development and standardization of methods in this field. One of the papers, the data of which are used later, is by Schabtach and Fehr (13), the other by Hatfield, Stanfield, and Rotherham (14).

Data on δ, as a function of stress, are evaluated in two different ways:

First, an empirical equation, as used by the author in a previous publication (1)

$$\delta = \delta_0 + \beta S^2 \quad [6]$$

is used; the constants δ_0 and β being adjusted to fit the experimental data. While such an equation is convenient for carrying out computations on vibrating structures, it does not lend itself to a physical interpretation. For this reason, as an alternative method, the conversion of δ into η^*, as previously explained under "Principle of Investigation," was carried out. Equation [1] was used. This equation is only approximate, and consequently the values of η^* give only the order of magnitude. However, for a comparison within groups of similar alloys, this is sufficient. A more accurate calculation would be illusory for two reasons: (*a*) The frequency ν, occurring in Equation [1], is not given accurately in either of the two papers; (*b*) the stress in the samples was not homogeneous. Maximum stresses are

TABLE 4 DAMPING CHARACTERISTICS OF ALLOY AND CARBON STEELS

Type of steel	Data on chemical composition	Test temperature, deg F	δ_0	β, 1/(psi)^2	η_0^*, poises	v, cm^3
3.5 per cent Ni steel	0.4 C, 0.8 Mn, 0.2 Si 3.5 Ni	75	0.052×10^{-2}	0.84×10^{-10}	1.7×10^{12}	0.89×10^{-21}
		900	0.50	2.9	1.4	3.1
Cr-Mo-Va steel	0.5 C, 0.5 Mn, 0.25 Si 1.0 Cr, 0.5 Mo, 0.3 Va	75	0.039	0.056	2.6	0.32
		900	0.067	0.85	1.4	1.9
13 per cent Cr steel	0.1 C, 0.5 Mn, 0.5 Si 0.5 Ni, 12.5 Cr	75	0.12	7.0	0.63	1.1
14 per cent Cr steel	0.09 C, 0.47 Si, 0.35 Ni 14 Cr	68	0.55	2.8	16	0.51
		750	0.76	0.75	13	0.61
18/8 Cr-Ni steel	0.11 C, 0.72 Si 0.86 Ti, 1.5 Al 18 Cr, 8.4 Ni	68	0.09	6.0	42	0.90
		930	0.05	3.9	64	2.3
Medium-carbon steel	0.22 Si, 0.66 Mn 0.09 Ni, 0.36 C	68	0.47	2.3	19	0.48
Low-carbon steel	0.17 Si, 0.56 Mn 0.13 Ni, 0.09 C	68	0.25	3.5	35	0.89

TABLE 5 DAMPING CHARACTERISTICS OF COPPER, NICKEL, AND LIGHT ALLOYS

Type of alloy	Data on chemical composition	Test temperature, deg F	δ_0	β, 1/(psi)^2	η_0^*, poises	v, cm^3
Cu-Sn alloy	94.2 Cu, 5.4 Sn	68	0.19×10^{-2}	0.51×10^{-10}	42×10^{12}	0.44×10^{-21}
Cu-Zn alloy	58.4 Cu, 1.1 Al 37.6 Zn, 1.0 Mn	68	0.11	1.5	89	0.89
Nickel	99.4 Ni	750	1.0	0.0	10	0.0
Fe-Ni alloy	35.0 Ni, 0.73 Si	750	0.03	1.0	260	2.6
Al-base alloy	4.7 Cu, 0.10 Si	68	0.27	0.0	35	0.0
Mg-base alloy	4.7 Al, 0.05 Si	68	0.07	96	53	4.3

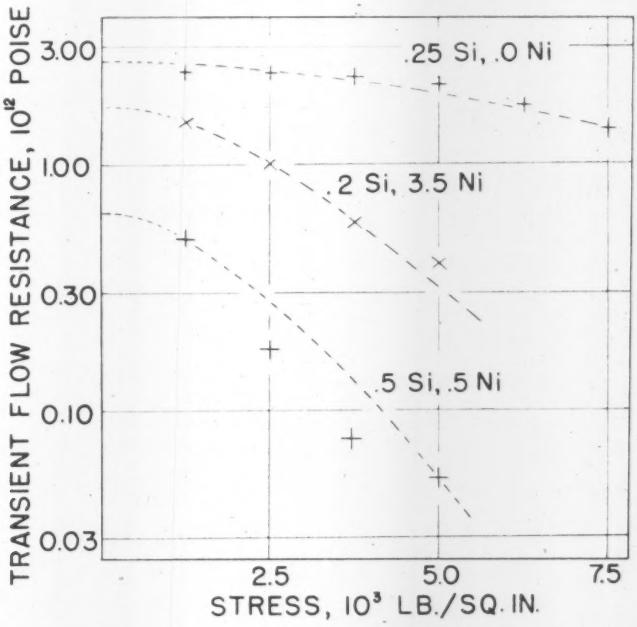


FIG. 5 TRANSIENT FLOW RESISTANCE VERSUS STRESS AT 75 F FOR THREE ALLOY STEELS

given in the papers, from which average stresses, as used later, were estimated according to the type of vibration in question.

Next, the transient flow resistance η^* is analyzed by assuming that an equation analogous to Equation [3] is valid. The initial value will be called η_0^*, whereas the volume $a\lambda$ will be denoted by v, as in the previous section. If the correlation between creep and damping as assumed here is real, the quantity v, as derived from damping data and from creep data, should not differ very much. Since the creep measurements of the previous section and the damping data in the present one do not refer to identical samples, all one can expect is that the order of magnitude of v is identical in both cases. This conclusion is verified by the analysis, as will be seen.

Data on iron-carbon alloys are summarized in the three groups of Table 4. The constants δ_0 and β of Equation [6] and the constants η_0^* and v of Equation [3] are given for each alloy and temperature. In using Equation [1], the frequency has to be known. In evaluating the data of Schabtach (Group 1) the frequency was assumed to be 1000 cps and for those of Hatfield (Groups 2 and 3) 10 cps was used.

Equation [3] is, as in the case of creep, valid only up to stresses of around 6000 psi. Beyond this limit the damping, although further increasing with stress, is lower (η^* larger) than calculated from Equation [3]. This analogous behavior of the two processes also points to a correlation between the two.

The first group of Table 4 contains three alloys, represented also in Fig. 5. The values of v show a pronounced sequence of increasing steepness. Although the influence of the alloying elements is not strictly obvious in this case, the role of silicon in increasing the steepness (by increasing v, the unit of flow) is fairly clear from the figure. Nickel again appears to increase the initial value of η^*, although the top curve contradicts this conclusion. Nickel is certainly not the only alloying element effective in this respect.

The second group is rather instructive. The two samples are also shown in Figs. 6 and 7, for the low- and high-temperature ranges, respectively. The role of silicon in increasing the stress dependence, and the role of nickel in increasing the initial resistance are rather conspicuous in this case.

In the third group the second of the samples has the higher v and η_0^*. The compositions in this case are not essentially different, so the difference might be due to the heat-treatment. As can be seen, the order of v is 10^{-21} cm^3, the same as was the case for creep.

The values for η_0^* in the first group (data of Schabtach) are much smaller than in the second (data of Hatfield). The reason probably is that in the latter case, because of the low frequencies used, Equation [1] loses its validity. As was done under "Creep of Alloys," comparison should be restricted to alloys within the same group.

From a study of the data on copper, nickel, and light alloys, tabulated in Table 5 (from Hatfield's data), the Cu-Zn alloy appears to be preferable with respect to damping characteristic to the Cu-Sn alloy, as can be seen from the values for η_0^* and v. From among the nickel samples, the second with 0.73 per cent

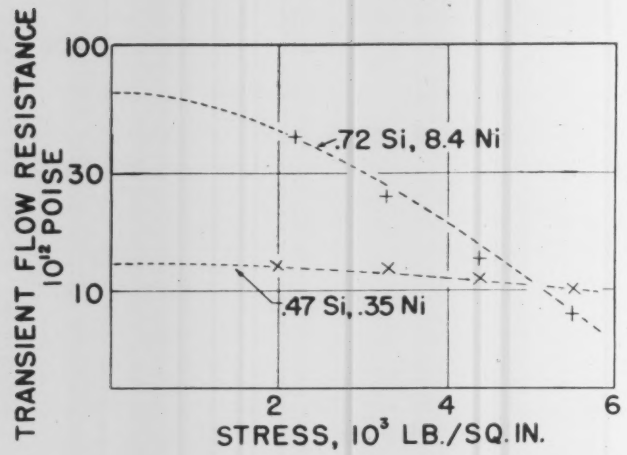


FIG. 6 TRANSIENT FLOW RESISTANCE VERSUS STRESS AT 68 F FOR TWO ALLOY STEELS

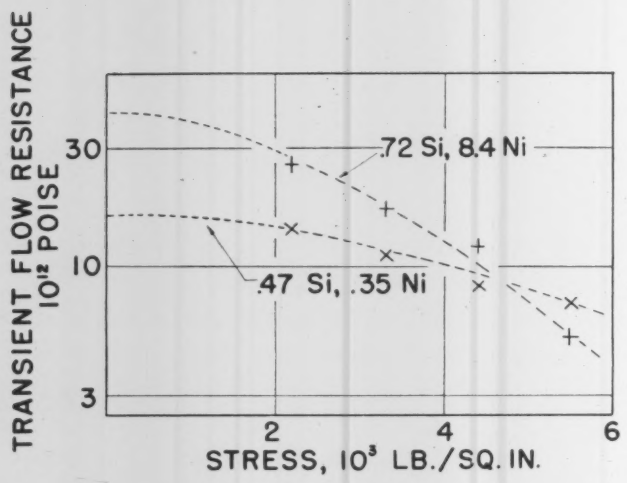


FIG. 7 TRANSIENT FLOW RESISTANCE VERSUS STRESS AT 750 AND 930 F FOR TWO ALLOY STEELS

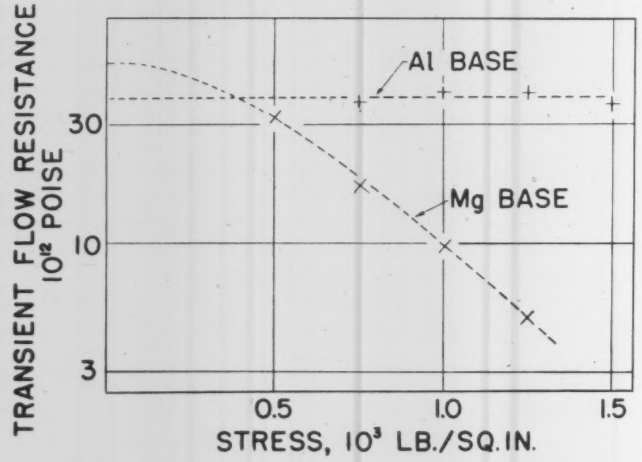


FIG. 8 TRANSIENT FLOW RESISTANCE VERSUS STRESS AT 68 F FOR AN ALUMINUM- AND A MAGNESIUM-BASE ALLOY

silicon and 35 per cent nickel (the balance is iron) has excellent properties.

Finally, a comparison of an aluminum- and a magnesium-base alloy shows the latter to be superior, as is shown also in Fig. 8. Note that in all cases the same conclusions can be drawn from an examination of the empirical constants δ_0 and β, but for reasons previously discussed an analysis by means of the transient flow resistance is considered superior.

CONCLUSION

It is found that alloys having damping characteristics of pronounced stress dependence do exist, and that such a characteristic is particularly promoted by additions of silicon and nickel. There are undoubtedly alloying elements which promote this characteristic that are not revealed by the limited experimental material available. Also, heat-treatment, which has not been considered in this paper, is undoubtedly of great importance. Additional and more systematic experimental research will be necessary before more conclusive results can be obtained. The purpose of this paper is essentially to promote such research. It is believed that an analysis approached by way of the flow resistance is particularly suited for the purpose because of the possibility of physical interpretation of the constants. If Eyring's equation is applicable in this case, that is, if the size of the unit of flow determines the stress dependence, then physical considerations of the influence of added atoms on the size of atomic aggregates will help in planning the production of alloys of required damping characteristics in a systematic manner.

Finally, it should be mentioned that, on the basis of the correlation between creep and damping characteristics, a method of finding the former by means of the latter might be devised. This would involve a considerable saving of time in testing procedures. However, before the reliability of such a procedure can be established, the part played by thermal processes as one of the causes of damping will have to be established definitely. The selection of experimental conditions which eliminate thermal processes would overcome this difficulty.

The correlation between creep and damping by means of the two components of the flow resistance can be applied not only in the field of alloys but also in the field of plastics. An analysis with regard to the influence of composition upon the stress dependence of damping can be carried out in the field of plastics, too, when sufficient systematic experimental data become available.

BIBLIOGRAPHY

1 "The Problem of Reduction of Vibrations by Use of Materials of High Damping Capacity," by Andrew Gemant, *Journal of Applied Physics*, vol. 15, 1944, pp. 33–42.

2 "Frictional Phenomena. XIII," by Andrew Gemant, *Journal of Applied Physics*, vol. 14, 1943, pp. 204–216.

3 "Exploring Stress-Strain Relations of Isotropic Plastic Solids," by W. Prager, *Journal of Applied Physics*, vol. 15, 1944, pp. 65–71.

4 "Effect of Strain Rate Upon Plastic Flow of Steel," by C. Zener and J. H. Hollomon, *Journal of Applied Physics*, vol. 15, 1944, pp. 22–32.

5 "Creep of Metals," by Saul Dushman, L. W. Dunbar, and H. Huthsteiner, *Journal of Applied Physics*, vol. 15, 1944, pp. 108–124.

6 "Creep of Metals at Elevated Temperatures," by P. G. McVetty, Trans. A.S.M.E., vol. 65, 1943, pp. 761–769.

7 "Creep Data," A.S.M.E. and A.S.T.M., 1938.

8 "Investigation of Creep and Fracture of Lead and Lead Alloys for Cable Sheathing," by H. F. Moore, B. B. Betty, and C. W. Dollins, Engineering Experiment Station, University of Illinois, Urbana, Ill., Bulletin No. 306, 1938.

9 "Physics of Metals," by Frederick Seitz, McGraw-Hill Book Company, Inc., New York, N. Y., 1943.

10 "Elastic-Viscous Properties of Matter," by A. Tobolsky, R. E. Powell, and H. Eyring, in Western Reserve University, "Frontiers in Chemistry," vol. 1, "The Chemistry of Large Molecules," Interscience Publishers, Inc., New York, N. Y., 1943, pp. 125–190.

11 "Inorganic and Theoretical Chemistry," by J. W. Mellor, Longmans, London, vol. 6, 1930.

12 "Vibration Problems. Part V—Friction and Damping in Vibrations," by A. L. Kimball, Trans. A.S.M.E., vol. 63, 1941, p. A-135.

13 "Measurement of the Damping of Engineering Materials During Flexural Vibration at Elevated Temperatures," by C. Schabtach and R. O. Fehr, *Journal of Applied Mechanics*, Trans. A.S.M.E., vol. 66, 1944, p. A-86.

14 "The Damping Capacity of Engineering Materials," by W. H. Hatfield, G. Stanfield, and L. Rotherham, Trans. of the North East Coast Institution of Engineers and Shipbuilders, vol. 58, 1942, pp. 273–332.

To A.S.M.E. Members:
THE COUNCIL REPORTS FOR 1944

THE year saw a sustained high level of war production and an increased tempo of attack. The triumphs in Europe and the Pacific raised hopes of an early termination of hostilities and emphasized the need of planning for the peace.

The Society, with more than 2500 members in the armed forces and a majority of the remainder active on the production front, wholeheartedly supported the war effort through the medium of meetings and publications, research and standardization, by providing technical information to war agencies, and by making available qualified personnel.

Jointly with other engineering societies, the A.S.M.E. is contributing to the solution of the major problems which confront the profession, notably the organization of the profession, the economic problems faced by engineers, and the enhancement of the status of the profession.

The sustained high interest in the meetings of the Society evidenced the value of the Society in a national emergency. Despite some war restrictions, the publication, research, and standardization programs were carried on vigorously and successfully. The membership increased from 16,613 (Sept. 30, 1942) to 17,485 (Sept. 30, 1943) to 18,333 (Sept. 30, 1944). Society income, the largest since 1930, permitted the addition of a substantial amount to surplus for future use.

In addition to the elected officers who make up the Council, some 2500 members on standing and special committees, technical, administrative, divisional, and local, are devoting their efforts to the business of the Society.

THE SOCIETY AND THE WAR

Several special agencies organized for the war effort are making outstanding contributions. Special research committees on shell and bomb forging have made valuable reports to the Ordnance Department of the Army. A proposal is under consideration to take up shell turning. Working with the Office of Production Research and Development of the War Production Board, the Manufacturing Engineering Committee has reviewed some 35 production problems and is engaged in an active program of disseminating new data on high-speed milling. More than a million data sheets on this subject have been sent to 5000 firms and individuals. The War Production Committee of the Society is maintaining intimate contact with the production and supply problems of the war and is giving aid unofficially in these problems. The chairman of this committee has traveled thousands of miles to address Society sections on the logistics of war.

The regular agencies of the Society have devoted attention to the special problems war has brought. The meetings of the Society, which have never before been so well attended, are largely devoted to war and postwar problems. The publications, despite the paper shortage, have supported this interest. The Boiler Code Committee has issued Alternate Rules, which permit the use of lesser quantities of critical materials.

The joint agencies in which the Society participates are also making contributions to the war effort. The Library is meeting an increase in technical inquiries. The American Standards Association has found enlarged opportunity particularly in standardizing and simplifying screw threads. The Engineering Societies Personnel Service, Inc., has aided in finding qualified engineers for war agencies. The Division of Engineering and Industrial Research of the National Research Council, through many committees, has provided advisory engineering services to war activities. The Engineers' Consultative Committee to the War Manpower Commission was organized through the initiative of E.C.P.D. to aid in solving engineering manpower problems.

On July 20, 1944, the Ordnance Department of the Army conferred its Distinguished Service Award on the Society "in recognition of outstanding and meritorious engineering advisory services, in war and peace, for the development, manufacture, and maintenance of Ordnance materiel."

THE SOCIETY IN INTERNATIONAL AFFAIRS

The Society traditionally has evidenced strong interest in developing co-operation with the engineers of other nations, and the war has resulted in an intensification of this interest with the engineers of our allies and the neutral nations.

At a joint meeting with The Engineering Institute of Canada held at Toronto, Sept. 30–Oct. 2, 1943, problems of design and production relating to the co-operative effort between the two nations during the war were discussed. During the year, a written agreement of co-operation was consummated with The Engineering Institute of Canada. An important ceremony was held at the British Embassy in Washington on June 6, 1944, at which the British Ambassador, Viscount Halifax, presented a portrait of James Watt to the Society, on behalf of The Institution of Mechanical Engineers. An interchange of missions between Britain and this country has resulted in a promise of agreement on screw-thread standardization.

Prof. Paul B. Eaton, former vice-president of the Society, returned from a year's service in China with a request for co-operation from the Chinese Institute of Engineers. This request has been approved by the Council and is being carefully worked out. When Professor Eaton was in China, means were established by supplying Chinese engineers with microfilms of engineering periodicals. In addition, the Freeman Fund Committee has perfected a plan for conferring a Freeman Scholarship on a Chinese graduate in mechanical engineering to pursue postgraduate study in the application of machinery to agriculture.

In South America, a joint Committee on Inter-American Co-operation, working through the Inter-American Development Commission and the National Research Council, is administering a program for providing technical information to the Latin-American republics as it is requested. The Woman's Auxiliary of the Society has chosen a Calvin W. Rice Scholar from Peru who will enter an American school in November.

Plans are being considered by the National Management Council, of which the Society is a member, and the International Committee for Scientific Management, for an international management congress in Sweden at the close of hostilities.

ADVANCING MECHANICAL ENGINEERING

MEETINGS

Attendance and interest in meetings of the Society, the divisions, and the sections have been greater than ever before. The 1943 Annual Meeting exceeded past records, with a registration of 4566, and the Birmingham (Spring) and the Pittsburgh (Semi-Annual) Meetings also topped previous similar gatherings. The programs, which were largely devoted to the discussion of war production, management, and personnel, have proved of great value to the members in this time of national emergency and have demonstrated the great vitality of

the Society. All professional divisions and a number of special and technical committees contributed to the richness of the programs from which it is difficult to select particular features. Worthy of special mention are the addresses by Charles F. Kettering on "Ingenuity and Inventiveness," at the 1943 Annual Meeting; by Major General G. M. Barnes on "Keying Research to Battle," at Birmingham; and by Igor Sikorsky on the "Helicopter," at Pittsburgh.

Interest in the programs was heightened by the presentation of honors. Honorary membership was conferred upon Lieut. General A. G. L. McNaughton at the Toronto Meeting. At the 1943 Annual Meeting, honorary memberships were conferred upon Francis Blossom, Edward N. Trump, and Roy V. Wright; the A.S.M.E. Medal upon Lewis K. Sillcox; the Holley Medal on Vannevar Bush; the Hess Junior Award on Troels Warming; the Charles T. Main Prize on Mitchell C. Kazen; and the Hess Undergraduate Award on William L. Hutton. Also at the Annual Meeting the John Fritz Medal and the 1940 A.S.M.E. Medal were bestowed on Charles F. Kettering and the Gantt Medal on Dexter S. Kimball. Igor Sikorsky received the Worcester Reed Warner Medal at the Pittsburgh meeting.

The Society is gratified with the attention given to meeting programs and speakers by the daily press.

Table 1 gives an analysis of the programs of national and division meetings, in all of which the local section at the place of meeting co-operated wholeheartedly.

TABLE 1 ANALYSIS OF PROGRAMS OF NATIONAL AND PROFESSIONAL DIVISION MEETINGS

	Meetings		
Society:	Sessions	Papers	Registration
Fall, jointly with Engineering Institute of Canada, Sept. 30, Oct. 1–2, 1943, Toronto, Canada	7	20	842
Annual, Nov. 29–Dec. 3, 1943, New York, N. Y.	68	217	4566
Spring, April 3–5, 1944, Birmingham, Ala.	16	46	535
Semi-Annual, June 19–22, 1944, Pittsburgh, Pa.	31	74	1441
Professional Division:			
A.S.M.E.-A.I.M.E. Joint Fuels and Coal Conference, Oct. 28–29, 1943, Pittsburgh, Pa.	5	7	350
Oil and Gas Power, May 8–10, 1944, Tulsa, Okla.	5	12	350
Aviation, June 5–8, 1944, Los Angeles, Calif.	12	35	800
Applied Mechanics, June 16–17, 1944, Chicago, Ill.	10	10	115
Total	154	421	8999
Corresponding totals for 1942–1943	120	291	6343

In anticipation of heavy travel on the railroads in the fall of 1944, the meeting planned for Cincinnati was canceled.

The 70 local sections reported 494 meetings held in addition to the national and division meetings.

For some time, consideration has been given to a national lecture scheme which would make two or three outstanding engineers available to local sections. Plans have been completed, and early in the coming year, the first lecturers, Dr. Lionel S. Marks, professor emeritus of mechanical engineering at Harvard University, and Dr. Stephen Timoshenko, professor emeritus of applied mechanics, Stanford University, will commence their tours. Dr. Marks's subject will be "Gas Turbines and Jet Propulsion;" Dr. Timoshenko will speak on "Stress Concentration and Fatigue Failures."

PUBLICATIONS

The limitation of the use of paper has created the greatest problem faced by the publications during the year. The size of the sheet and the weight of the paper stock used were reduced and in addition 2200 members generously gave up receiving some of their publications. The Membership List was issued in July on lightweight paper and the geographical and student lists were omitted to save paper. Several groups of papers of interest to small groups of members were printed in pamphlet form for limited distribution. As a last resort, advertising pages have been omitted from the copies of MECHANICAL ENGINEERING sent to student members.

A scheme of photolithographing manuscripts has been adopted for preprints.

Advertising and sales income from publications has shown a marked increase during the Society year.

PROFESSIONAL DIVISIONS

During the year, the individual professional divisions made considerable improvement in the functioning of their organizations. New rules and a new manual for division operation have been published. The divisions made their usual contributions to the programs of the Society, the contribution of the Aviation Division being particularly noteworthy. The Metals Engineering Division is initiating the compilation of a Metals Engineering Handbook.

Better understanding of Society and division policy on the part of the standing committees, local sections, and professional divisions has been developed by means of frequent joint meetings of the two groups. Members of the standing committee on professional divisions attended the regional delegates conferences in the fall of 1944.

A Consulting Engineering Group was set up during the year. This new group is devoting some attention to standard systems of accounts for consultants and standard forms of contracts for consulting services. A joint committee on Consulting Engineering with The Engineering Institute of Canada has been proposed.

LOCAL SECTIONS

Despite the demands made by the war upon the members of the Society, the activities of the 70 sections have been carried on with excellent results during the Society year.

STUDENT BRANCHES

Notwithstanding the pronounced effect of the war on engineering education, student branches have continued to function and the student membership on April 1, 1944, was about 70 per cent of that in the peak year. Ten student-group meetings were held during the spring of 1944 with 71 student branches participating. The scheme of student dues has been made more flexible to encourage membership on the part of students taking Army and Navy courses.

RESEARCH

During the last year the research committees of the Society sponsored sixteen technical sessions at the general meetings of the Society and also provided papers for the programs of other sessions at meetings of the A.S.M.E. and other societies. The sponsored sessions were those held by the standing committee in co-operation with the Fuels, Power, Heat Transfer, Applied Mechanics, and Production Engineering divisions, and the Manufacturing Engineering Committee; and those sponsored by the research committees on lubrication, metal-cutting data and bibliography, furnace performance factors, plastic flow of metals, critical-pressure steam boilers, boiler feedwater studies, effect of temperature on the properties of metals, and forging of steel shells.

STANDARDIZATION

During the year five standards developed by sectional committees, functioning under the administrative sponsorship of the A.S.M.E., were completed and presented to the American Stand-

ards Association for approval either as new American Standards, revisions of existing standards, or supplements to existing standards. The list of these standards in the order in which they were completed during the Society year follows:

Socket Set Screws and Socket Head Cap Screws (Supplement), B18
Cast-Iron Pipe Flanges and Flanged Fittings, Class 250 (revision), B16
Spring Lock Washers, B27
Code for Pressure Piping (Supplement No. 1), B31
Inspection and Tolerances for Gears, B6

Nineteen additional projects were active during the year.

POWER TEST CODES

Fifteen of the individual Power Test Code committees were engaged in active work on their projects during the year. One code on coal pulverizers was published in May, 1944, and two new sections of the Code on Instruments and Apparatus were issued during the year, one on resistance thermometers and the other on measurement of surface areas.

SAFETY

Nine of the individual safety-code projects were active during the year. No publications were issued.

BOILER CODE

In the last year the Boiler Code Committee prepared and issued Alternate Rules for the Construction of Power Boilers and for Unfired Pressure Vessels. These rules are based on special rulings issued in 1942 and permit an increase in design stresses for fusion-welded boilers and unfired pressure vessels. Other Code revisions will not permit the construction of circumferential fusion-welded pipe joints without a backing ring. Another revision permits the use of rupture heads as protective devices on unfired pressure vessels. Twelve new material specifications, principally for nonferrous materials, were added to the Code. In order to meet a pressing need, the table of allowable working stresses for nonferrous materials was considerably extended and enlarged.

THE OLD GUARD

The Old Guard, made up of those members who, by length of Society tenure, are not required to pay dues, voluntarily raised funds for prizes and special honoraria for students. At present the Old Guard is engaged in a plan to raise funds for a scholarship.

THE SOCIETY AND THE PROFESSION

The Society is discharging its obligation to its members and to the engineering profession by co-operating with other engineering societies in a number of joint agencies which are considering paramount problems.

"THE FIVE PRESIDENTS"

On September 29 the presidents of five societies, the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, American Institute of Electrical Engineers, and the American Institute of Chemical Engineers, issued a joint statement to the press proposing a plan for controlling productive capacity in postwar Germany. This proposal met with wide acclaim in the press and gave evidence of the recognition that will be granted to authoritative statements by the profession on problems within its scope.

THE JOINT CONFERENCE COMMITTEE

Organized in 1940, the Joint Conference Committee is made up of the presidents, junior past-presidents, and secretaries of five societies, the American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, American Institute of Electrical Engineers, and American Institute of Chemical Engineers. The Joint Conference Committee considers matters of common concern to the societies and makes recommendations to the participants.

In addition to lesser matters, two of prime concern were before it at the close of the Society year. The first, the organization of the engineering profession, was explored by a committee of three which outlined broadly (1) the organization of strong local bodies with (2) representatives in state bodies who (3) constitute a national Congress of Engineers. This general outline is being considered by a committee of fifteen members.

The second matter, the status of the engineer, originated with this Society. In 1943, the American Society of Civil Engineers initiated a plan by which its local sections might choose to establish themselves as bargaining agencies for groups of engineers. The Council discussed the problem during the 1943 Annual Meeting and came to the conclusion that information was needed about conditions in industry under which engineers worked. A joint study with the American Institute of Electrical Engineers was planned. Later the American Society of Civil Engineers became a participant, and the American Institute of Mining and Metallurgical Engineers and the American Institute of Chemical Engineers appointed observers to attend meetings. It was decided to make an investigation through industries rather than through individual engineers. After a preliminary survey, this approach was found to be impractical and at the close of the year a new approach was being planned under the general guidance of the Joint Conference Committee.

ENGINEERS' COUNCIL FOR PROFESSIONAL DEVELOPMENT

The Engineers' Council for Professional Development, organized in 1932 to enhance the status of the engineer, is composed of three representatives of eight engineering bodies: American Society of Civil Engineers, American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, American Institute of Electrical Engineers, The Engineering Institute of Canada, the Society for the Promotion of Engineering Education, American Institute of Chemical Engineers, and the National Council of State Boards of Engineering Examiners.

The program of E.C.P.D. is made up as follows:

(*a*) Selection and guidance of engineering students.
(*b*) Review of engineering curricula and the publication of a list of accredited curricula.
(*c*) Development of a program of postcollege training, a manual on which is in preparation.
(*d*) Establishment of criteria for recognizing attainment in engineering.
(*e*) Preparation of "Canons of Ethics," which three of the participating societies have approved.

E.C.P.D. published a pamphlet, "Will you Help?" suggesting means by which local engineering groups can organize to carry on the programs of E.C.P.D.

THE ENGINEERING FOUNDATION

The Engineering Foundation was established in 1914 as a result of the first of a series of gifts from Ambrose Swasey.

The purpose of this foundation is "the furtherance of research in science and engineering and the advancement in any other manner of the profession of engineering and the good of mankind." The corpus of the gifts remains intact; only the income from the investments is used for the support of research projects. The control of this income and of the researches remains in The Foundation Board composed of representatives of the Founder Societies. All projects are sponsored by one or more of these societies.

The war has diverted research from fields normally supported by the Foundation and has reduced the number of projects given grants in aid. Projects of special interest to this Society are: Temperature distribution in tube walls subjected to high rates of heat input; plastic flow of metals; investigation of stress-strain relations in various drawing processes; and unsteady-heat-flow investigations.

The Engineering Foundation has contributed $5000 toward the 1943-1944 activities of E.C.P.D.

UNITED ENGINEERING TRUSTEES, INC.

A collection of books is not often regarded as the nucleus in bringing together the engineering societies. Yet we are reminded by one of our older members, that this is exactly what happened. One of the flourishing young societies in the late 1890's was offered some valuable technical works if suitable housing could be promised. Andrew Carnegie, well known for his generous gifts of library buildings, was approached. His clear vision prompted an immediate counter proposition that if the several engineering groups would get together, he would give one and a half million dollars for the erection of a suitable "union home" for the societies, which would also take care of the books.

This union home for the engineering societies was dedicated in April, 1907, and has been the center of engineering activities ever since. The building, now 37 years old, in the titular ownership of United Engineering Trustees, Inc., for the Founder Societies and carried by the societies on their balance sheets as an asset, is still in good condition physically, but the growth of the societies and the increase of their activities have put a severe strain on their once-adequate quarters. The Engineering Societies Building is fully occupied by the Founder Societies and other engineering societies known as Associates, all of whom contribute their share toward the upkeep of the building. Co-operation has been extended to the Government by making meeting halls available to uniformed units for instruction and other meetings. The property is carried on the books at $1,993,793.92. There is a depreciation fund of about $500,000. The property is exempt from taxation.

During the Society year, the Trustees gave intensive consideration to the following questions:

(*a*) How can the Engineering Societies Building be made more adequate for the needs of the Founder Societies?

(*b*) How can the increasing maintenance costs of the aging building, and increasing wages under the labor board's activities, be met without unduly affecting the Founder Societies' budgets?

(*c*) How can employees be cared for at the age of retirement after long periods of service to the societies, without excessive budget demands?

The trustees have studied ways and means of increasing endowments for support of the Library and for the Engineering Foundation.

The building is fully utilized, but 40 per cent of it is devoted to the library and meeting halls which are not productive of income in the form of rent paid by the Societies for the space they occupy.

The funds and investments of the Corporation amounting to more than $1,500,000, have been closely watched by the Trustees and by expert financial advisers. The portfolio consists of well-balanced, high-grade investments, and the income has been maintained at a good rate.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

The annual convention of the American Association for the Advancement of Science usually held during the Christmas holidays was canceled in 1943.

Section M (Engineering) of A.A.A.S. held a Symposium on Biomechanics at the Engineering Societies Auditorium, New York, N. Y., on Nov. 3, 1943. Thorndike Saville, dean of engineering, New York University, chairman of the section, presided.

During the year Dr. I. Melville Stein, director of research, Leeds and Northrup Company, Philadelphia, Pa., a member of A.S.M.E., was elected vice-president, Section M (Engineering), A.A.A.S. Frank D. Carvin, professor and head, department of mechanical engineering, Newark College of Engineering, a member of A.S.M.E., served as secretary of the section.

INTER-AMERICAN ENGINEERING CO-OPERATION

A joint committee on Inter-American Engineering Co-operation, is working with the Inter-American Development Commission to co-operate with engineers in Latin-American republics. The 22 engineering societies in other republics have been informed of the organization of the American Committee which is to be extended by funds made available by the Commission and administered through the National Research Council. Five American engineering societies have selected lists of papers of interest to Latin-American engineers. These lists have been offered and originals or translations promised. Some requests for originals have been received. Copies of the latest edition of the Engineering Index were sent to the 22 societies and microfilms of scientific articles promised. Some requests have been received.

THE ADMINISTRATION OF THE SOCIETY

THE PRESIDENT, COUNCIL, AND EXECUTIVE COMMITTEE

The President visted 17 local sections and 8 student branches. At each point visited he spent several days, calling on the engineering leaders in the community to discuss plans for reconversion of industry and the part the Society is playing in aiding engineers in the armed forces in their postwar problems.

Other members of the Council attended the Local Section Conferences and Student Branch Conferences and visited sections and branches in their respective areas.

The Council met in New York in December, 1943, and in Pittsburgh in June, 1944, for business sessions. An informal meeting was held in Birmingham in April, 1944. The Executive Committee met in New York twelve times. The actions taken at these meetings were reported in MECHANICAL ENGINEERING or are reflected in this report. Dr. H. L. Guy, secretary of The Institution of Mechanical Engineers, was a welcome guest at the May, 1944, meeting of the Executive Committee.

FINANCES

The year brought forth a substantial increase in Society income and a corresponding gain in its financial stability. The complete report of the Finance Committee follows this report directly.

DELEGATES AND GROUP DELEGATES CONFERENCES

Delegates from local sections met in eight areas during the fall of 1943 and two representatives from each area met in a Group Delegates Conference in New York during the 1943 Annual Meeting. In addition to the discussion of important administrative problems, the Group Delegates Conference recommended: (1) that the A.S.M.E. take lead in developing a profession-wide association of engineers; (2) that the Society embark on a campaign to educate the public about the importance of engineers; and (3) that the Society set up some form of employment clearing house both at Annual and Semi-Annual meetings.

CERTIFICATE OF AWARD

A uniform certificate of appreciation for recognition of members' substantial services to the Society was adopted for use by all committees, national and local. Upon recommendation to,

TABLE 2 CHANGES IN MEMBERSHIP

(Sept. 30, 1943, to Sept. 30, 1944)

	Membership		Increases			Decreases				Changes		
	Sept. 30 1944	Sept. 30 1943	Transferred to	Elected	Reinstated	Transferred from	Resigned	Dropped	Died	Increases	Decreases	Net change
Honorary Members	31	28	3	2	0	0	0	0	2	5	2	+ 3
Fellows	148	132	22	0	0	0	0	0	6	22	6	+ 16
Members	8791	8454	50	573	68	25	58	140	131	691	354	+337
Associates	224	204	4	27	4	0	4	5	6	35	15	+ 20
Junior (20)	1301	1131	176	83	45	30	23	79	2	304	134	+170
Junior (15)	1257	1096	380	48	31	200	6	92	0	459	298	+161
Junior (10)	6583	6440	0	917	77	380	37	425	9	994	851	+143
Total membership	18335	17485	635	1650	225	635	128	741	156	2510	1660	+850

and favorable action by, the Executive Committee, the certificates may have the Society seal imprinted and bear the signatures of the president and secretary.

MEMBERSHIP

Suggestions flowing from the 1943 Group Delegates Conference and from the Aviation Division resulted in a program of the Executive Committee for some changes in the scheme of membership grades. The Committee on Admissions spent a large amount of time in reviewing the proposed scheme.

The Committee on Admissions reached two decisions of general importance:

1 That credit for work done in the Army Specialized Training Program should be determined at the institutions where the work has been done.

2 That final action on all applicants of citizens of enemy alien countries should be deferred until final citizenship has been obtained.

The Committee on Admissions held eleven regular meetings, one by proxy in July, and a special meeting to consider the proposed membership changes.

The following are the applications considered in the transactions of its work and a summary showing the actions taken:

Applications pending, Oct. 1, 1943	319
Applications received during the fiscal year 1943–1944	2254
Total applications handled during the year 1943–1944	2573
Recommended for membership	2170
Transfers denied	9
Deferred	23
Withdrawn, incomplete, and canceled	15
Deceased	1
Applications pending Sept. 30, 1944	355
Total applications handled during the year 1943–1944	2573

The 2170 recommended for membership were divided into the following grades:

Transfers to Fellow	25
Members	627
Transfers to Member	114
Associates	37
Juniors	361
Transfer from Student-Member to Junior Member	1006
Total Recommended	2170
Transfers	139
	2031

SOCIETY REORGANIZATION

During the year, a committee on Society Reorganization appointed in December, 1943, prepared recommendations for a change in the organization of the Council. These recommendations are to be discussed at the 1944 Annual Meeting.

BOARD OF REVIEW

The Board of Review held three meetings during the fiscal year ending Sept. 30, 1944. These resulted in 336 recommendations to the Executive Committee of the Council.

	1943–1944	1942–1943	1941–1942
Cancellation of dues	0	3	9
Resignations	120	157	228
Reinstatements	135	224	259
Dropped	0	0	4
Previous dropped or resigned actions rescinded	81	65	44
Recommended for dues exemption	0	0	3

In the year no requests for cancellation of dues were received.

MEMBERSHIP DEVELOPMENT

During the year, a Committee on Membership Development has been formulating a program for increasing Society membership. The committee includes representatives of local sections, professional divisions, student branches, and technical committees. At the close of the year, a proposal was approved by the Executive Committee that a standing committee be established for this purpose.

CONSTITUTION AND BY-LAWS

Upon recommendation of the interested agencies, the Council approved a change in the Constitution deleting the word "Local" from the term "Local Section." This change is to be submitted to ballot by the members when other constitutional amendments are submitted.

Other matters being considered by this Committee for recommendation to the 1944 Annual Meeting are: (1) Changes in Article B4, Paragraphs 2 and 5 dealing with election of honorary members; (2) amendments to the Constitution necessary to put into effect certain changes in membership grades; (3) amendments to give effect to changes in Council organization.

THE SECRETARY'S OFFICE

At the meeting of the Council on Dec. 3, 1943, honoraria were given and the appreciation of the Society expressed to ten members of the staff who had had 25 or more years of service. In order of term of service, they were: Frances Selig, Ernest Hartford, Frederick Lask, Katherine W. Clendinning, Louise J. Reinschmidt, Marguerite Marty, Jean Brown, Clifford B. LePage, Martha Jurist, and August W. Schrage.

The leaves of absence of the Secretary, Colonel C. E. Davies, and Major Leslie Zsuffa were extended for the year. Permission was continued to Mr. C. B. LePage, assistant secretary, to serve part time in the Conservation Division, W.P.B.

COMMITTEE REPORTS

The complete reports of the committees of the Society and of its representatives on joint agencies are embodied in a pamphlet of 52 pages which is available upon request.

DEATHS

During the year the Society lost, through death, four Honorary Members: Mortimer E. Cooley, a past-president of the Society: Geo. A. Orrok, and Edward N. Trump, both former members of the Council; and E. Bruce Ball, past-president of The Institution of Mechanical Engineers. The death of V. M. Palmer, chairman of the Special Committee on Registration, also occurred during the year.

A.S.M.E. FINANCE COMMITTEE REPORT, 1943-1944

THIS fiscal year marks the completion of a long-time program designed to place the Society on a sound financial basis. The Finance Committee envisaged four aims: (1) elimination of all doubtful assets on the Balance Sheet, (2) creation of a minimum surplus to insure stability in the Society's operations through the next recession in business, (3) the investment of this surplus in such a way that it will be available at a hundred cents on the dollar when needed, and (4) reconstruction of the trust funds to original value. It may now be said that these ends have been accomplished.

Attainment of these objectives has been greatly helped by the wholehearted co-operation of successive Councils and by what is essentially a windfall in that income has for some time consistently exceeded our budgeted figures which necessarily have to take into account the probability of early changes in fundamental conditions.

The Finance Committee is aware that there is a substantial body of members who feel that it is a mistake to lay aside much surplus, i.e., current income should be entirely devoted to service to members. This view is understandable and there is nothing to be said against it if the consequences of such a spend-as-you-go policy are fully understood and accepted. The fact of the matter is that Society income may drop as much as half in a serious business recession Many members drop out and advertising income melts away. The effect of a corresponding reduction in the budget on Society activities would be disastrous and members who continue paying dues would not get value received. Our staff is also entitled to consideration.

Much time and thought have been given to the economic status of the engineer. The financial history of most engineers and most engineering concerns is that they laboriously accumulate a surplus over a period of years only to lose it periodically in recurring business recessions. Many mechanical enterprises are notoriously "feast or famine" yet each depression is strewn with wreckage of large numbers of such businesses and the employment offices are crowded with engineers who are in distress through no fault of their own other than ignorance of some rather simple but important economic concepts.

It should be remembered that business is like many a human being in that it periodically goes on a "bender." Then comes the headache—"the morning after." With business the headache may be unemployment and failure. Wars give us **super**-benders.

Experts differ on what will happen to us after this war. Some say the headache will be terrific. Some say we will go on an even greater spree and then have the headache. Some say there need be no headache at all—if we will take their brand of economic medicine. Nobody knows the answer now, but we should—we must be prepared.

The guess of the Finance Committee is that history will repeat itself; that we will continue to have good and bad times; that the dollar will continue to be the world's safest money and that we should make hay while the sun shines and be sure to stow it in a safe place.

For this last purpose the Finance Committee has been resorting largely to War Savings Bonds which combine safety with a rate of interest higher than that paid by most saving banks. They are readily redeemable without loss.

The membership may therefore continue in the assurance that the Society's finances are being administered in a prudent manner and the Society is reasonably prepared to maintain a satisfactory standard of service through any probable eventualities that may arise in postwar reconversion or other subsequent adjustment.

Respectfully submitted,

K. W. JAPPE, *Chairman*
J. J. SWAN, *Vice-Chairman*
W. H. SAWYER
J. NOBLE LANDIS
G. L. KNIGHT
W. G. CHRISTY } *Council*
R. F. GAGG } *Representatives*
W. D. ENNIS, *Treasurer*

OPERATING SUMMARY

A Balance Sheet. Accountants' Certificate. B Comparative summary of income and expense. C Statement of surplus. D Statement of changes in funds. E Detailed cost of activities. F How the A.S.M.E. spent its 1943–1944 income.

The Balance Sheet, Exhibit A, of September 30, 1944, shows, on that date, that the Society owed:

(1)	Current bills and Federal Tax withheld from Employees	$ 5,772.71
(2)	Obligations for printing and distributing the 1945 Mechanical Catalog, bills for which have not been submitted	25,956.98
(3)	Other obligations for which bills have not been submitted	10,477.12
(4)	Unexpended appropriations for future services	44,550.68
(5)	Special research and other committees which have collected funds for special purposes to be expended as needed	57,838.09
(6)	Future services to members who have prepaid dues.	$104,661.72
(7)	Advertisers and subscribers to publications who have prepaid	4,026.90
		$253,284.20

To meet these debts the Society had:

(1)	Cash in the bank	$134,299.44
(2)	Accounts receivable	93,794.39
(3)	Inventories of publications and supplies conservatively valued at	25,660.44
(4)	Securities (at the lower of cost or approximate quoted market values)	388,088.51
(5)	Deferred charges	1,441.42
		$643,284.20

The difference between the value held by the Society of $643,284.20 and debts of $253,284.20 is net worth of Society on September 30, 1944 $390,000.00

The Society had other liabilities:

(1)	Trust funds amounting to		$127,424.77
	against which the Society had the following assets:		
	(a) Cash	$ 29,360.64	
	(b) Notes receivable	497.50	
	(c) Securities (at the lower of cost or approximate quoted market values)	97,566.63	
		$127,424.77	
(2)	Property fund of		$531,193.61
	with the following assets to support it:		
	(a) Quarter interest in building	$498,448.48	
	(b) Office furniture and fixtures (depreciated value)	32,743.13	
	(c) Library books	1.00	
	(d) Engineering Index, Inc.—Title and good will	1.00	
		$531,193.61	
(3)	Employees' Retirement Fund of		$130,786.18
	covered by:		
	Cash	$ 66,319.59	
	Securities (at approximate quoted market value)	64,466.59	
		$130,786.18	
(4)	Development Fund of		$ 13,413.40
	Cash	$ 13,413.40	

EXHIBIT A

BALANCE SHEET—SEPTEMBER 30, 1944

ASSETS				LIABILITIES		
GENERAL FUND:				GENERAL FUND:		
Cash in banks and on hand			$ 134,299.44	Accounts payable		337.56
Accounts receivable:				Federal income tax withheld from employees		5,435.15
Dues—current year	11,569.36			Accrued liabilities:		
Dues—prior years	1,696.68			Estimated liability relating to Mechanical Catalog 1944–1945	$ 25,956.98	
	$13,266.04			Other accrued liabilities (estimated)	10,477.12	36,434.10
Less—Reserve	13,266.04					
		—		Reserve for unexpended appropriations		44,550.68
Publications and advertising	$90,262.03			Unexpended balances of Custodian Funds		57,838.09
Less—Reserve	2,394.82	$ 87,867.21		Deferred credits:		
				Dues and initiation fees paid in advance	$104,661.72	
Miscellaneous		5,927.18	93,794.39	Prepaid subscriptions (estimated)	4,000.00	
				Prepaid advertising	26.90	108,688.62
Inventories, at cost or less:						
Publications completed		$ 10,175.30		Surplus (Exhibit C)		390,000.00
Publications in process		11,618.07				$ 643,284.20
		$ 21,793.37				
Less—Reserve		2,678.06				
		$ 19,115.31				
Supplies		6,545.13	25,660.44			
Securities:						
Real estate mortage bond and certificate (cost $25,316.32)		$ 16,196.06				
Railroad and industrial stocks and bonds (at the lower of cost or approximate quoted market values)		14,936.39				
United States of America Savings Bonds, Series F and G (at current redemption values)		234,838.85				
United States of America Treasury Bonds (at cost)		122,117.21	388,088.51			
Prepaid expenses of regional meetings			1,441.42			
			$ 643,284.20			
DEVELOPMENT FUND (Formerly Rotative Project Fund):						
Cash in banks			13,413.40	DEVELOPMENT FUND (Exhibit D)		13,413.40
EMPLOYEES' RETIREMENT FUND:						
Cash in banks		$ 66,319.59				
Real-estate mortgage bond (cost $13,860)		8,910.00				
United States of America Savings Bonds, Series F (at current redemption values)		35,500.35				
United States of America Treasury Bonds (at cost)		20,056.24	130,786.18	EMPLOYEES' RETIREMENT FUND (Exhibit D)		130,786.18
TRUST FUNDS:						
Cash in banks		$ 29,360.64		TRUST FUNDS, including unexpended income (Exhibit D)		127,424.77
Notes receivable (Major Toltz Fund)		497.50				
Securities (at lower of cost or approximate quoted market values):						
Stocks	$10,118.89					
Real-estate mortgage certificate	833.68					
U.S.A. Bonds, Series F and G (at current redemption values)	81,600.00					
United States of America Treasury Bonds	5,014.06	97,566.63	127,424.77			
PROPERTY FUND:						
One-fourth interest in real estate and other assets of United Engineering Trustees, Inc., exclusive of Trust Funds		$498,448.48		PROPERTY FUND		531,193.61
Office furniture and fixtures (depreciated value)		32,743.13				
Library books		1.00		NOTE: Initiation and promotion fees receivable are not included in the above statement as they are taken up by the Society only as and when collected.		
Engineering Index, Inc.—Title and good will		1.00	531,193.61			
			$1,446,102.16			$1,446,102.16

EXHIBIT B

COMPARATIVE SUMMARY OF INCOME, EXPENSES, AND APPROPRIATIONS

For the Two Years Ending September 30, 1944

	Year 1942–1943	Year 1943–1944
INCOME:		
Initiation and promotion fees (to surplus)	$ 13,008.42	$ 19,655.00
Membership dues*	$241,594.17	$257,597.53
Student dues	26,715.35	12,279.00
Interest and discount (net)	5,388.35	4,205.51
MECHANICAL ENGINEERING adv.	178,457.30	246,070.02
Mechanical Catalog advertising	68,517.82	83,199.10
Publication sales	91,474.82	104,254.98
Miscellaneous sales	1,684.79	2,491.02
Contributions—*Journal of Applied Mechanics*	500.00	....
Engineering Index, Inc.	798.60	1,356.60
Registration fees	405.00	1,113.00
Sale of equipment	35.00	75.00
Membership list advertising	....	1,029.00
TOTAL INCOME	$615,571.20	$713,670.76
EXPENSES AND APPROPRIATIONS:		
Expenses under committee supervision (including appropriation of $20,000 to Employees' Retirement Fund in 1942–1943 and $5,000 in 1943–1944)	$103,047.30**	$ 99,934.41**
Publication expense	191,197.02	210,868.85
Office expense	261,155.97	316,594.56
Appropriation to reserve for mortgage investments—interest on mortages and mortgage certificates in excess of 3% on the book value thereof for the six months ending March 31, 1943	841.19	....
Total expenses and appropriations***	$556,241.48	$627,397.82
Excess of income over expenses and appropriations	$ 59,329.72	$ 86,272.94

* Membership dues have been stated on the basis of total cash received during the year.

** Includes assessment by United Engineering Trustees, Inc., of $3,000 in 1942–1943 and $6,828.75 in 1943–1944 for building operating deficit.

*** Includes reserves for unexpended appropriations of $19,000 in 1942–1943 and $39,400 in 1943–1944.

EXHIBIT C

STATEMENT OF SURPLUS

Year Ending September 30, 1944

BALANCE, SEPTEMBER 30, 1943		$306,063.83
ADD:		
Initiation and promotion fees collected		19,655.00*
Excess of income over expenses and appropriations for the year (Exhibit B)		86,272.94
Unexpended balances of prior years' appropriations		9,926.51
Net profit on sale of investments:		
Profit on real-estate mortgage certificates	$11,821.92	
Net loss on stocks	235.17	
		11,586.75
Transfer of reserve for real-estate mortgage bonds and certificates provided in prior years from net profit on sales and portion of interest income		13,574.50
Collections on account of claims against guarantors of mortgage participation certificates		1,037.59
Transfer from Trust Funds of deceased life members' balances, etc.		539.44
		$448,656.56
DEDUCT:		
Adjustment of carrying value of United States of America Savings Bonds, Series G, to current redemption value at September 30, 1944	$ 636.00	
Special appropriation to Employees' retirement fund	58,020.56	
		58,656.56
BALANCE, SEPTEMBER 30, 1944		$390,000.00

* As it is the practice of the Society to take up initiation and promotion fees only as and when collected, the above statement does not include such fees receivable at September 30, 1944.

ACCOUNTANTS' CERTIFICATE

TO COUNCIL OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

We have examined the balance sheet of The American Society of Mechanical Engineers as of September 30, 1944, and the summary of income, expenses and appropriations and statements of surplus and changes in funds for the fiscal year ending that date. Our examination was made in accordance with generally accepted auditing standards applicable in the circumstances, and included such tests of the accounting records and other supporting evidence and such other procedures as we considered necessary.

In accordance with the practice followed by the Society in prior years, no effect has been given in the statements to accrued income on investments.

The membership dues are included in the income account of the current year on the basis of total cash received on account of that year and prior years and provision has been made for all dues uncollected at September 30, 1944.

In our opinion, the accompanying balance sheet and related summary of income and expenses and statements of surplus and changes in funds present fairly the position of The American Society of Mechanical Engineers at September 30, 1944, and the results of its operations for the fiscal year on the basis indicated in the foregoing paragraphs and the appended statements.

(Signed) PRICE, WATERHOUSE & Co.

New York, N. Y.
November 6, 1944

EXHIBIT D

STATEMENT OF CHANGES IN FUNDS

Year Ending September 30, 1944

DEVELOPMENT FUND (Formerly Rotative Project Fund)		
BALANCE AT SEPTEMBER 30, 1943, AND SEPTEMBER 30, 1944		$13,413.40
EMPLOYEES' RETIREMENT FUND		
BALANCE AT SEPTEMBER 30, 1943		$ 66,556.63
Add:		
Income from investments		1,181.43
Interest on savings bank deposits		27.56
Appropriations from:		
General Fund income	$ 5,000.00	
General Fund surplus	58,020.56	
		63,020 56
BALANCE AT SEPTEMBER 30, 1944		$130,786.18
TRUST FUNDS		
BALANCE AT SEPTEMBER 30, 1943		$123,006.24
Add:		
Income from investments		2,031.01
Interest on notes receivable		54.29
Interest on savings bank deposits		52.68
Net profit on sale of investments		4,117.73
Contribution to Gantt Medal Fund		258.98
Appropriations from General Fund		700.09
Life memberships purchased		581.60
TOTAL FORWARD		$130,802.62

TRUST FUNDS (*Continued*)		
TOTAL BROUGHT FORWARD		$130,802.62
Deduct:		
Expenditures for prize awards, etc.	$ 1,090.29	
Write-off of notes receivable carried at nominal value of $1 each	2.00	
Proportion of life membership dues transferred to General Fund income	1,160.00	
Transfer to General Fund surplus of deceased life members' balances, etc.	539.44	
Investment custodian fees	22.12	
Adjustment of carrying value of United States of America Savings Bonds, Series G, to current redemption value at September 30, 1944	564.00	
		3,377.85
BALANCE AT SEPTEMBER 30, 1944		$127,424.77

EXHIBIT E

DETAILED COST OF A.S.M.E. ACTIVITIES 1943–1944

(Approved by Finance Committee October 13, 1944)

Description	Expense under committee supervision	Printing and distribution expense	Office expense	Total Cost 1943–44	Total Cost 1942–43
Council	$ 4,575.00			$ 4,575.00	$ 5,500.00
Library	9,830.91			9,830.91	9,471.20
U.E.T. Deficit	6,828.75			6,828.75	3,300.00
Smith Survey—Status of the Engineer	3,500.00			3,500.00	
Engineers' Council for Professional Development	2,050.00			2,050.00	2,050.00
Finance Committee	115.00			115.00	108.00
Awards	1,187.22		$ 508.85	1,696.07	1,583.89
Nominating Committee	912.00			912.00	587.44
Local Sections	27,256.03		7,182.37	34,438.40	33,970.65
Lectureships	3,000.00			3,000.00	
Meetings and Program	14,077.05		13,749.53	27,826.58	19,513.42
Professional Divisions	3,700.00		13,750.62	17,450.62	14,530.24
Admissions			10,301.80	10,301.80	8,883.06
Employment Reserve	2,000.00			2,000.00	2,000.01
Student Branches	7,107.66	$ 3,247.06	5,296.80	15,651.52	19,905.55
Technical Committees	1,000.00		24,556.22	25,556.22	22,918.24
MECHANICAL ENGINEERING Text Pages		28,856.30	11,888.43	40,744.73	40,962.05
Transactions and *Journal of Applied Mechanics*	179.71	38,762.33	14,430.92	53,372.96	50,764.02
Membership List		7,602.35	5,583.10	13,185.45	7,500.00
MECHANICAL ENGINEERING Advertising Pages		48,400.92	49,701.72	98,102.64	82,913.27
A.S.M.E. Mechanical Catalog		32,520.00	34,886.35	67,406.35	56,060.14
Publication Sales		51,479.89	12,205.22	63,685 11	51,698.67
Retirement Fund	7,700.00			7,700.00	22,700.00
Professional Services	1,798.50			1,798.50	1,448.50
Membership Development	2,500.00			2,500.00	4,500.00
Organization Charts	616.58			616.58	135.05
Secretary's Office			24,236.10	24,236.10	20,447.51
Accounting			21,482.60	21,482.60	18,783.01
General Service			35,831.70	35,831.70	31,674.29
General Office			31,002.23	31,002.23	21,792.08
	$ 99,934.41	$210,868.85	$316,594.56	$627,397.82	$555,400.29

How the A.S.M.E. Spent Its Income in 1943-1944

EXHIBIT F

Dues Income: $257,597.53—$14.05 per Member.

The principal item of income is the dues paid by the members. Juniors pay $10, $15, or $20 depending upon their age; Members pay $20, Fellows, $25, except that those who have been on the rolls of the Society for 35 years or who have reached 70 and have been members 30 years are carried without dues. On September 30 the Society had 18,333 members on its rolls and during the year $257,597.53 was collected in dues. The per-member dues income is therefore $14.05.

The publications of the Society are MECHANICAL ENGINEERING, Transactions, including the *Journal of Applied Mechanics*, the Membership List, and the A.S.M.E. Mechanical Catalog and Directory. Income is obtained from advertising in Mechanical Engineering and in the Catalog. An income and expense statement for the publications appears below.

PUBLICATIONS

	Direct expense	Income
MECHANICAL ENGINEERING	$138,847.37	$246,070.02
Transactions (including *Journal of Applied Mechanics* and Membership List)	66,558.41	1,029.00
A.S.M.E. Mechanical Catalog	67,406.35	83,199.10
Publications sold	63,685.11	104,254.98
	$336,497.24	$434,553.10
Indirect Expense	62,976.97	
	$399,474.21	
Income	434,553.10	
Net income from publications	$ 35,078.89	
Total expense of publications per member	21.78	
Income from publications per member	23.70	
Net income per member	$ 1.92	

Technical Committee Work: Net Expense $31,502.31—$1.72 per Member.

The Society has over four hundred technical committees engaged in the work on research, establishing power test codes, preparing the boiler code, and preparing standards and safety codes. The work of these committees is supported by direct staff expense which in 1943–1944 was $25,556.22. Adding to it indirect general expense of $5,946.09 gives a total expense of $31,502.31, which on a per-member basis is $1.72. The principal output of the technical committees is publications which are sold to members and to others. This figure of expense should therefore be considered in relation to the publication expense of the Society.

General Society Activities: Net Expense $177,238.79—$6.40 per Member.

The general activities of the Society include the holding of meetings, the operation of Local Sections, Professional Divisions, Student Branches, the administration of the procedure for admitting members to the Society, and the bestowal of awards. The Society receives income from Students for their membership in the Society. The following tabulation shows the net expense for this activity.

GENERAL SOCIETY ACTIVITY

	Direct expense	Income
Society Meetings	$ 27,826.58	$ 1,113.00
Local Sections	34,438.40	
Professional Divisions	17,450.62	
Student Branches	15,651.52	12,279.00
Admissions	10,301.80	
Awards	1,696.07	
Lectureships	3,000.00	
	$110,364.99	$13,392.00
Indirect Expense	20,265.80	
	$130,630.79	
Less Income	13,392.00	
Net cost of general Society activities	$117,238.79	
Total expense of general Society activities per member	7.13	
Income per member	.73	
Net expense per member	$ 6.40	

Joint Activities: Net Expense $35,994.60—$1.96 per Member.

The Society also participates in a number of joint activities such as the Library, Engineers' Council for Professional Development, and the joint Employment Service. In addition to the payments to these joint bodies for these purposes a certain amount of general expense is allocated to these activities. The following tabulation gives the total of this expense.

JOINT ACTIVITIES

	Direct expense
Engineering Societies Library	$ 9,830.91
Engineers' Council for Professional Development	2,050.00
United Engineering Trustees (Deficit)	6,828.75
Smith Survey—Status of the Engineer	3,500.00
Employment Service (Reserve)	2,000.00
	$24,209.66
Indirect Expense	11,784.94
Total cost of joint activities	$35,994.60
Expense per member	$ 1.96

Administration: Net Expense $21,667.78—$1.18 per Member.

In carrying out the Society activities, certain administrative services must be provided. These include the expense of the Council, the Nominating Committee, and the provision for auditing, legal, and other services. Certain general income is received. The following tabulation shows the amount of this expense and income.

GENERAL SOCIETY ADMINISTRATION

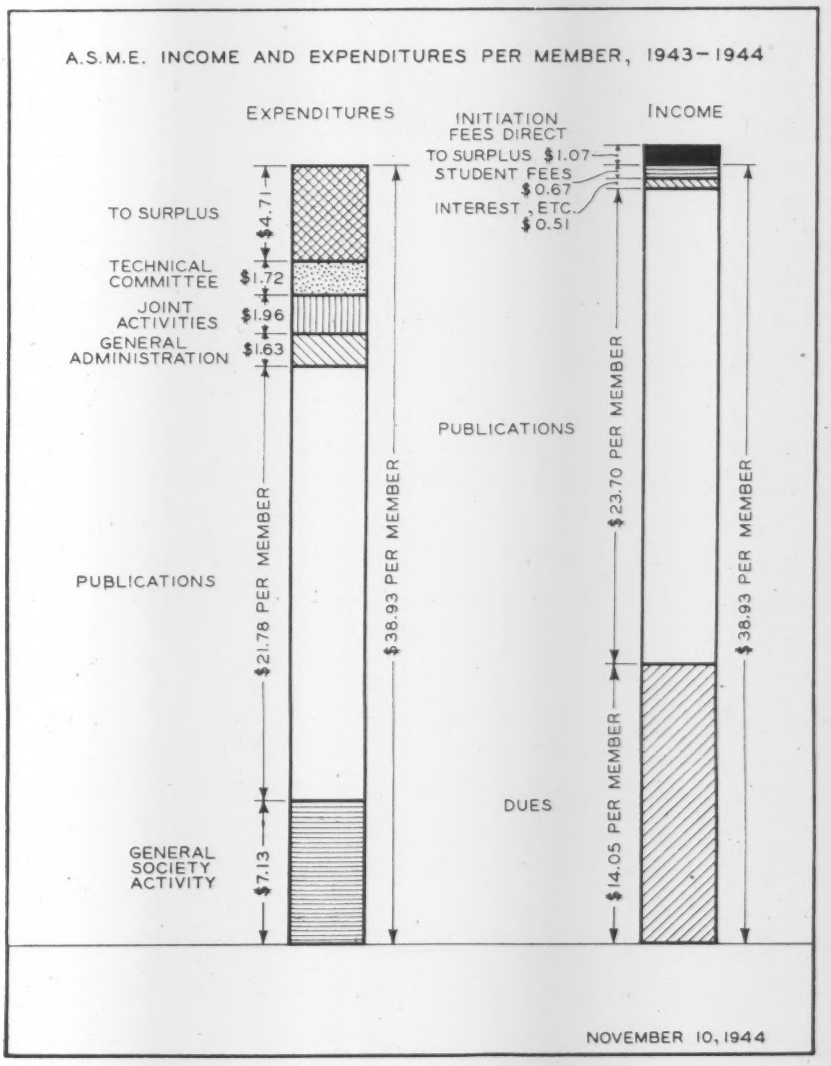
	Direct expense
Council	$ 4,575.00
Organization Charts	616.58
Membership Development	2,500.00
Retirement Fund	7,700.00
Professional Services	1,798.50
Finance Committee	115.00
Nominating Committee	912.00
	$18,217.08
Indirect expense	11,578.83
	$29,795.91
Income from interest and miscellaneous	8,128.13
Net cost of general Society administration	$21,667.78
Expense per member	1.63
Income per member	.45
Net expense per member	$ 1.18

RECAPITULATION

	Expenses	Income
Dues	$	$257,597.53
Publications	399,474.21	434,553.10
General Society Activity	130,630.79	13,392.00
Technical Committee Work	31,502.31	.....
General Society Administration	29,795.91	8,128.13
Joint Activities	35,994.60	.....
	$627,397.82	$713,670.76
Addition to surplus from operating income	86,272.94	
	$713,670.76	

INCOME AND EXPENSE PER MEMBER

	Expense per member	Income per member	Net expense per member
Dues	.....	$14.05	.....
Publications	$21.78	23.70	—$1.92
General Society Activity	7.13	.73	6.40
Technical Committee Work	1.72	.....	1.72
General Society Administration	1.63	.45	1.18
Joint Activities	1.96	.....	1.96
	$34.22	$38.93	
Addition to surplus from operating income	4.71		
	$38.93		



1944 A.S.M.E. ANNUAL MEETING

Held at Pennsylvania Hotel, New York, N. Y., Nov. 27–Dec. 1 Breaks All Records

BREAKING all previous attendance records with a total of 5000 members and guests registered, the 1944 Annual Meeting of The American Society of Mechanical Engineers once more demonstrated the strength and virility of the Society and the active interest that has been stimulated in the work of its professional divisions and technical committees on whom rests the major burden of preparing programs for the technical sessions. For the second year the Annual Meeting was held at the Hotel Pennsylvania, New York, N. Y., commencing on Sunday, November 26, with sessions of the Council, the Group Delegates Conference, and an informal evening gathering, and ending on Friday, December 1. The program was so crowded that as many as six simultaneous sessions were held on certain days in addition to committee meetings and conferences that demanded the attendance of members active in Society work.

In so far as the public was concerned, the 58 technical sessions, the Annual Banquet and Honors Night, which filled the ballroom and adjacent Keystone Room to capacity (1559 persons), and the luncheons (ten were scheduled on the program), provided a bewildering array of interest. In addition, however, numerous special luncheons, dinners, and committee meetings made a busy week even busier for members directly concerned with them.

A comprehensive report of such a full week could be attempted only if dozens of persons were delegated to cover every phase of it; and the result would be an extensive series of documents the publication of which would overburden the allotment of paper available for the printing of MECHANICAL ENGINEERING. A considerable number of the technical papers and discussions will be published in the Society's regular publications as the papers themselves become available for printing and opportunity for including them presents itself. Much more in the way of practical results will follow throughout the year as the discussions at committee meetings are translated into action. In the meantime it is practicable to present only the briefest report of the features of general interest, with a promise to readers that they will have an opportunity to study the technical papers at their leisure as soon as publication can be arranged.

Wartime conditions resulted in the late receipt of many important papers. In spite of this fact it was possible to provide for use at the meeting preprints of at least 76 of the papers presented. Many of these were received so late that only by the reproduction by the photolithographic process of the author's original manuscript could copies be made available. The task of deciding which of these papers, and also which of those not received until the time of the meeting, are to be put into permanent form is still before the divisions and committees in a majority of cases. As time goes on, however, these decisions will be taken and the selected papers will be published.

PROBLEM OF RETURNING SERVICE MEN

DISCUSSED AT INFORMAL SUNDAY EVENING SESSION

On Sunday evening members of the Council met with the members of the Group Delegates Conference and of standing and special committees to discuss problems and responsibilities in connection with members to be returned from the Armed Forces.

Presiding over the session was R. M. Gates, President of the Society, who first called upon Col. C. E. Davies, secretary, to introduce every man in the room.

A. R. CULLIMORE SPEAKS ON GUIDANCE

Mr. Gates then called upon A. R. Cullimore, member A.S.M.E., and president Newark College of Engineering, to describe the work of the Committee on Student Selection and Guidance, of which he is chairman, of the Engineers' Council for Professional Development.

Mr. Cullimore described first the work in progress in the field of student guidance and reviewed the history of the committee's activities in past years. Such work, he said, was being carried on by subcommittees in several sections of the country. Copies of the E.C.P.D. pamphlet, "Engineering as a Career," were being distributed to individuals and to groups whose interest lay in advising young men about their college courses and future careers.

Work in student selection, he said, had involved investigation and experience with various selection tests. Tests used by A. B. Crawford at Yale University had been studied by the Committee four or five years ago, and more recently the Carnegie Foundation for the Advancement of Teaching had been co-operating with E.C.P.D. and S.P.E.E. in objective tests of attitudes and aptitudes. Tests were now in the research stage and were being given in about 30 colleges in the United States and Canada. They were not yet available for general use, but great hopes were being entertained for their success.

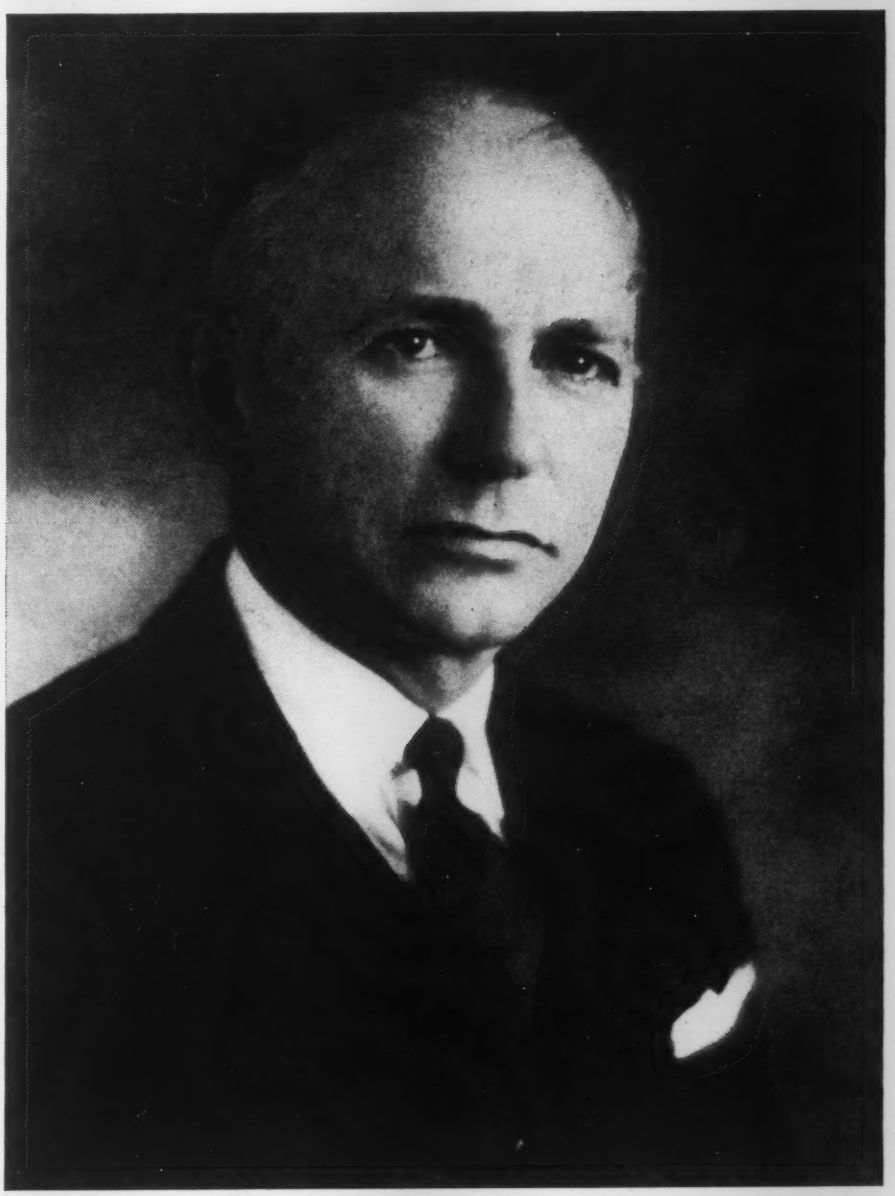
At present, Mr. Cullimore continued, the Committee was faced with guidance work with returning veterans. A pilot survey had been started in New York State. About 300 high schools had been asked if they wanted help in this form of guidance work, as it was felt that the high school was one of the principal places to which veterans would turn for advice and help. The high schools, he said, had responded with appeals for help, and copies of "Engineering as a Career" were being sent to them as background information.

The Veterans Bureau was also interested in the Committee's work, Mr. Cullimore said. Certain testing centers had been set up by the Bureau and his committee was working with the authorities at these centers. In his opinion local committees of engineers in many parts of the country could give valuable help.

ADULT EDUCATION URGED BY A. R. STEVENSON

At the conclusion of Mr. Cullimore's brief talk, Mr. Gates called upon A. R. Stevenson, member of the A.S.M.E. Council, to speak briefly about adult education. Mr. Stevenson commenced his informal address by stating that every executive had to be an educator. Moreover, education was one of those horizontal divisions of interest which cut across the entire membership and involved everyone. It was his opinion that the quality of leadership had deteriorated in industry and government and he assigned as one cause the fact that it had been forgotten that a leader must also be an educator.

Education, he said, did not stop with youth, and intelligence was not likely to deteriorate if a man continued some form of study. At different ages, he pointed out, different things were most easily learned; children learned to use languages; young people learned mathematics and physical science easily; with more experience the "science of life" be-



Alex D. Bailey

President of
The American Society
of
Mechanical Engineers
for 1945

came an intellectual interest in maturity. Engineering education was soundly based because it stressed the sciences when young people were able to learn them, and delayed cultural matters until greater maturity and experience had been attained.

It was typical, he continued, to learn some things by analogy. What applied in one case could be carried over into another by an intelligent person. Moreover, many of the most prized qualities of life were by-products. Happiness, for example, eluded those who sought it directly; security as an end in itself was a case of "killing the goose that laid the golden egg;" even in finance a certain amount of "adventuring" was necessary to build up capital; friendship, invention, and "service" were other examples of by-products.

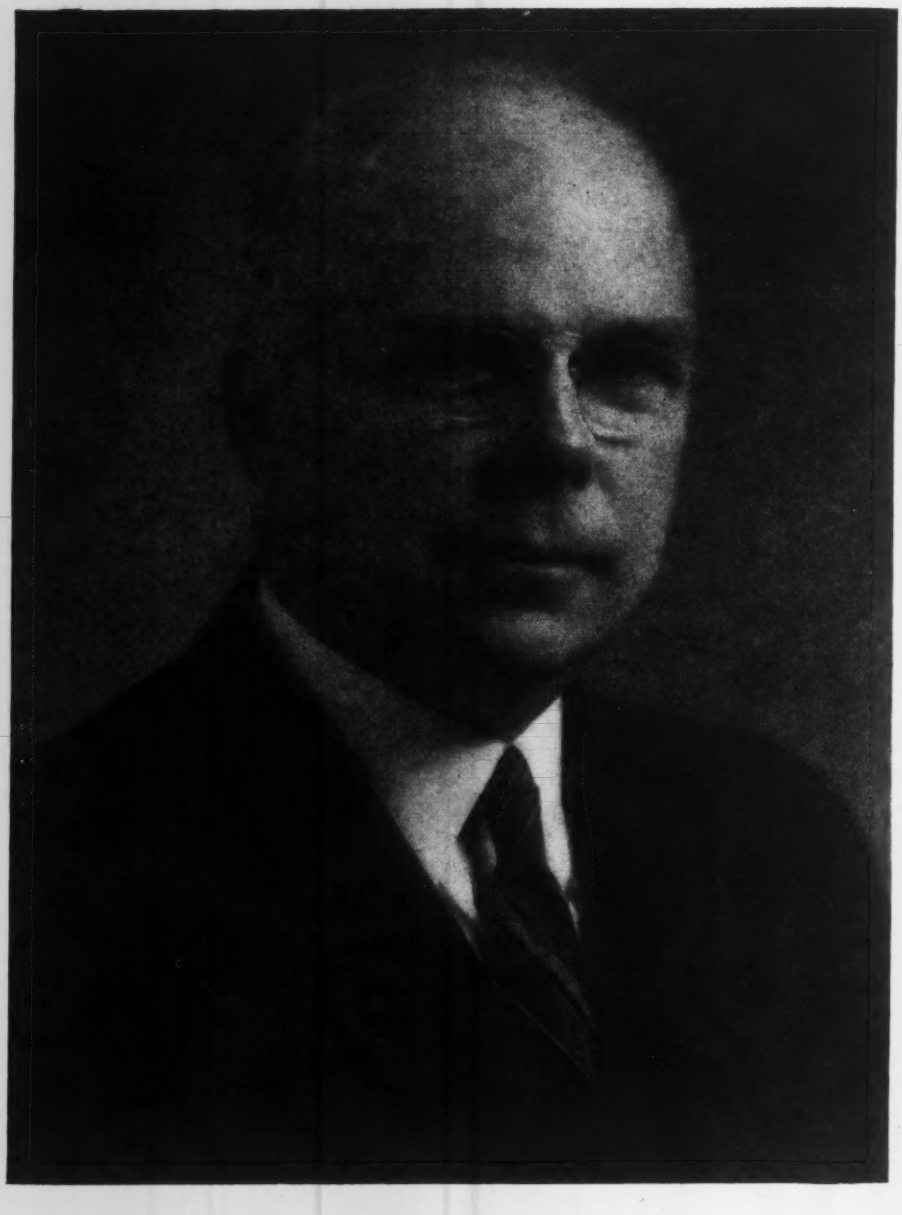
Mr. Stevenson said that adult education was important for better industrial management. He suggested that really high-grade men would benefit themselves, their colleagues, and the instructor if they were to take up some regular courses of study in order to broaden themselves and secure the satisfactions of a deeper understanding of life and knowledge. He quoted from a book, "On Education," by Sir Richard Livingstone in which it was urged that men undergo periods of regenerative study to keep their minds alert and facile and to prevent them from falling into a rut.

RESPONSIBILITY TO A.S.M.E. MEMBERS IN SERVICE

Mr. Gates then directed attention to what he termed the Society's first responsibility to the membership, the reorientation of the returning service man. Every local section, he said, would have to handle its own problems locally. Mr. E. G. Bailey, who was chairman of the Society's Committee on Engineering Opportunities, had discussed the problem with Mr. Gates many times, and one result had been the sending of letters to 3000 A.S.M.E. members in the Armed Forces, disclosing the Society's interest in their welfare, offering help, and asking for suggestions. (This letter was printed in MECHANICAL ENGINEERING, November, 1944, page 746.) Replies to this letter, which had been gratefully received, were now coming in, Mr. Gates said, and from some of these replies he read excerpts.

Mr. Gates asserted that the returning service man would be an entirely different individual from the one who entered the Armed Forces. The A.S.M.E., he said, owed these men everything it has to assist in the reorientation that might be necessary. Many men would come back with much broader horizons and with the consciousness that their future lay in fields previously unexplored by them.

The universities, Mr. Gates concluded, had been preparing to help their graduates. In his opinion, industry had not been doing as much as it should.



Robert M. Gates

Retiring President of
The American Society
of
Mechanical Engineers
for 1944

LIVELY DISCUSSION OF FUTURE PROBLEMS

Following Mr. Gates' brief comments, a lively discussion took place for upward of an hour in which many plans and experiences were recited by men in education and industry. There was no doubt but that a great deal of work was in progress; but opinions differed as to the extent of the problem in so far as engineers were concerned. There was some opinion that the great number of agencies getting interested in aid to returning veterans would result in confusion, and the suggestion was offered that the A.S.M.E. co-ordinate its activities with others. The Gates letter to A.S.M.E. members in the Armed Forces was warmly commended by many speakers. Mr. Cullimore particularly pointed out that readjustments were normal in life and must be made by the individual himself whenever possible. Help should be extended when the man failed to help himself.

ANNUAL DINNER A BRILLIANT AFFAIR

The Annual Dinner for Members, with which has been combined the A.S.M.E. Honors Night, took place in the ballroom of the Hotel Pennsylvania on Wednesday evening. With an attendance of 1559 it was necessary to seat members and guests in the gallery of the ballroom and in the Keystone room which opens onto the gallery. Even with these accommodations many persons were unable to procure tickets, and reservations had to be closed a week in advance of the dinner.

A record for rapid and efficient handling of the after-dinner ceremonies of presenting awards and honorary memberships was established. W. L. Batt, past-president of the A.S.M.E., who acted as toastmaster, announced at the end of this part of the program, that he had started 20 minutes late and had finished 15 minutes ahead of the tight schedule which had been arranged for him by the Dinner Committee. Contributing to this shortening of the program was the fact that R. M. Gates, retiring president, did not read his presidential address. He spoke briefly about it and announced that he was so concerned that those interested in what he had to say on the general subject of education should study it carefully that he would prefer to have the address read by members rather than take the necessary time to present it to them after the dinner. The complete text of his address will be found on pages 5–8 of this issue.

50-YEAR MEMBERS RECEIVE GOLD BUTTONS

Following the singing of the National Anthem, led by Thomas B. Allardice, member A.S.M.E., with Leslie N. Leet, member A.S.M.E., at the organ, the names of the "Fifty-Year

Members of A.S.M.E." were read. Of the 21 A.S.M.E. members who had completed 50 years of membership in 1944, four were present to receive the 50-year gold buttons conferred on this occasion. Those present were: Christopher H. Bierbaum, Sterling Haight Bunnell, Otto W. Schaum, and Albert Carroll Wood. The other 50-year members will receive their buttons on later occasions. These members are: William Marvin Armstrong, Harold Montfort Bush, Fred B. Corey, A. H. Eldredge, John T. Heffernan, William Floyd Hunt, James D. Hunter, John W. Logan, Lewis Keith Malvern, Henry C. Meyer, Jr., Percy H. Middleton, Howard Prescott Quick, William Sangster, Richard Addison Smart, Reid T. Stewart, Hugh Lindsay Thompson, and Thomas L. Wilkinson.

CARL L. BAUSCH PRESENTS MEDALISTS

In conferring honors and awards the candidates were escorted to the center of the speakers' table by members of the Committee on Medals, where the citations were read by Carl L. Bausch, chairman of the Committee. The awards were presented by President Gates. The following awards were presented:

Spirit of St. Louis Junior Award to Martin Goland, junior member, A.S.M.E., for his paper "The Influence of the Shape and Rigidity of an Elastic Inclusion on the Transverse Flexture of Thin Plates."

Spirit of St. Louis Medal to George W. Lewis, for leadership in direction and encouragement of aeronautical research, having an extensive influence on aeronautical engineering during the past quarter century.

Melville Medal to Ernest L. Robinson, member A.S.M.E., for his paper, "Bursting Tests of Steam-Turbine Disk Wheels."

Warner Medal to Earle Buckingham, member A.S.M.E., for original contributions to engineering literature.

Holley Medal to Carl L. Norden, for the invention and development of the Norden bombsight and other valuable devices which should hasten the peace.

A.S.M.E. Medal to Edward G. Budd, for the development of stainless-steel railway passenger cars.

HONORARY MEMBERSHIPS CONFERRED

Honorary memberships were conferred on the following:

Charles M. Allen, fellow A.S.M.E., professor of hydraulic engineering, Worcester Polytechnic Institute, Worcester, Mass.

Major General Levin H. Campbell, Jr., member A.S.M.E., Chief of Ordnance, United States Army, Washington, D. C.

Gano Dunn, fellow A.S.M.E., president J. G. White Engineering Corporation, New York, N. Y.

Vice-Admiral Emory S. Land, chairman, United States Maritime Commission, Washington, D. C.

Sir (Standen) Leonard Pearce, engineer in chief, London Power Company, London, England. (The certificate was received, in Sir Leonard's absence, by Sir William Wiseman.)

BIOGRAPHIES OF MEDALISTS AND HONORARY MEMBERS

Brief biographical sketches of the medalists (including the winners of the Chas. T. Main Award and Undergraduate Student Award who were honored at the Student Luncheon on Wednesday noon) follow:

FRED M. PIASKOWSKI

CHARLES T. MAIN AWARD, 1944

His paper entitled "A Case Study of Labor-Management Co-Operation" has won the 1944 Charles T. Main Award for Fred M. Piaskowski, who is working for a B.S. degree in mechanical engineering at the University of Detroit.

He was born in Detroit in 1917 and as a series of illnesses in his childhood impaired his hearing, he attended the Detroit Day School for the Deaf and the McMichael Intermediate School.

Following his graduation from the Northwestern High School he attended the University of Detroit for two years. In his third year he was employed by the Wolverine Tube Company on a co-operative basis and in 1940 he dropped his work at the University and for three years was engaged in the production of vital war goods in the capacities of draftsman, tool designer, and plant engineer with the Wolverine Company and the Nash-Kelvinator Corporation and C. J. Martin & Sons. He re-entered the university in 1943.

The Charles T. Main Award was established in 1919 from a fund created by Charles T. Main, past-president of the Society, to be awarded for the best paper within the general subject of the influence of the profession upon public life. The exact subject is assigned annually.

NELSON B. HAMMOND

UNDERGRADUATE STUDENT AWARD, 1944

A native of Philadelphia, where he was born in 1922, Nelson B. Hammond, recipient of the 1944 Undergraduate Student Award, attended public schools in that city. Following his graduation from the West Philadelphia High School, he took up the study of mechanical engineering at the University of Pennsylvania. He was graduated from the University in October, 1944. He wins the Undergraduate Student Award for his paper entitled "An Investigation of Silver Solder Penetration in Brass Joints."

Two Student Awards, established in 1914 from a fund created by Henry Hess, past vice-president of the Society, are presented for the best papers or theses submitted by student members. The postgraduate award is not being made this year.

MARTIN GOLAND

SPIRIT OF ST. LOUIS JUNIOR AWARD, 1944

His paper on "The Influence of the Shape and Rigidity of an Elastic Inclusion on the Transverse Flexure of Thin Plates," presented at the A.S.M.E. 1942 Annual Meeting and published in the *Journal of Applied Mechanics* in June, 1943, has won the 1944 Spirit of St. Louis Junior Award for Martin Goland, head, applied mechanics section, structures department, at the Research Laboratory of the Curtiss-Wright Corporation, Buffalo, N. Y.

Mr. Goland was born in 1919 and secured his engineering education at Cornell University, from which he received an M.E. degree in 1940. He remained at the university for two years as instructor in mechanics of engineering before he entered the employ of the Curtiss-Wright Corporation. He has also been a member of the staff of Engineering, Science, and Management Defense Training in Buffalo for two semesters.

He became a junior member of the A.S.M.E. in 1942 and is a junior adviser on the executive committee of the Aviation Division.

The Spirit of St. Louis Junior Award, established in 1938 by an endowment fund created by the General Committee for the 1935 Aeronautic Meeting in St. Louis, is made every three years for the best paper on an aeronautic subject presented by a junior member of the A.S.M.E.

GEORGE W. LEWIS

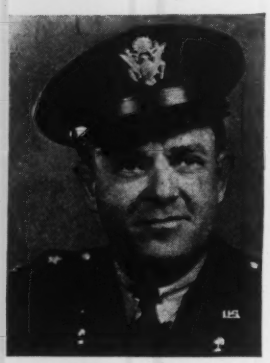
SPIRIT OF ST. LOUIS MEDAL, 1944

Recipient of the Daniel Guggenheim Medal in 1936, George W. Lewis is now presented the Spirit of St. Louis Medal "for leadership in direction and encouragement of aeronautical research, having an extensive influence on aeronautical engineering during the past quarter century."

Dr. Lewis was born in Ithaca, N. Y., in 1882 and received the M.E. degree from Cornell University in 1908. He was instructor at the University until 1910, when he secured his master's degree. While at Cornell he was associated with G. B. Upton in the development of a fatigue-testing machine, and during the next seven years on the faculty of Swarthmore

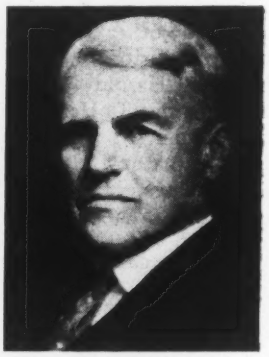
Made Honorary Members of the A.S.M.E.

EMORY S. LAND
Honorary Membership



LEVIN H. CAMPBELL, JR.
Honorary Membership

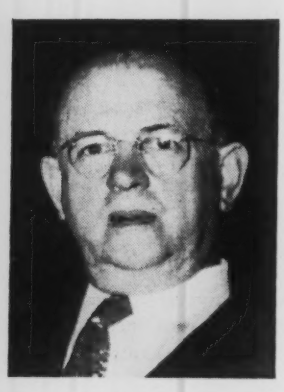
GANO DUNN
Honorary Membership



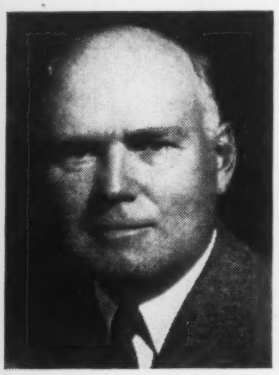
CHARLES M. ALLEN
Honorary Membership

New Members of the 1945 A.S.M.E. Council

Vice-Presidents



DAVID LARKIN

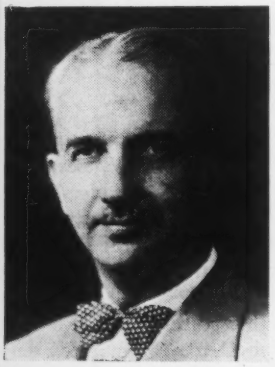


JOHN E. LOVELY

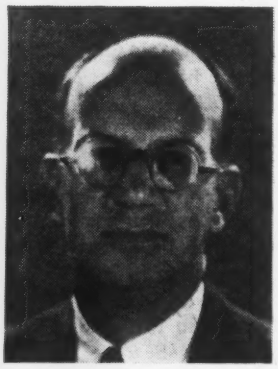
THOMAS S. MCEWAN

Managers

DANIEL S. ELLIS



A. J. KERR



H. G. THIELSCHER

Recipients of Medals and Awards

CARL L. NORDEN
Holley Medal

EDWARD G. BUDD
A.S.M.E. Medal

ERNEST L.ROBINSON
Melville Medal

EARLE BUCKINGHAM
Warner Medal

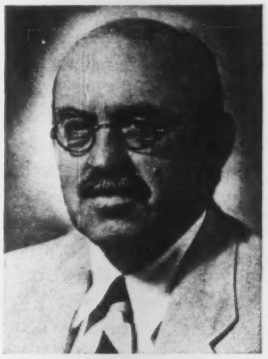
GEORGE W. LEWIS
St. Louis Medal

MARTIN GOLAND
St. Louis Junior Award

FRED M. PIASKOWSKI
Charles T. Main Award

NELSON B. HAMMOND
Undergraduate Award

LILLIAN M. GILBRETH
Gantt Medal



RALPH E. FLANDERS
Hoover Medal

College he collaborated with H. C. Hayes in devising a simplified means of determining the elastic limit of tensile-test specimens which resulted in the Lewis-Hayes extensometer.

Under a co-operative arrangement with the Clarke Thomson Research, who engaged Dr. Lewis as engineer in charge in 1917, he was appointed a member of the Committee on Power Plants for Aircraft of the National Advisory Committee for Aeronautics and prepared for the committee the design of the first experimental Roots-type supercharger for aircraft engines. In 1919 he was made executive officer of the N.A.C.A. and in 1924, director of aeronautical research for that body. Under his leadership it has become a highly efficient agency operating a research laboratory, with many important items of equipment to its credit.

Dr. Lewis also served as a member of the War Department's Special Committee on Army Air Corps in 1934 and was a plenipotentiary delegate of the United States to the Inter-American Technical Aviation Conference, Lima, Peru, in 1937. He was president in 1939 of the Institute of Aeronautical Sciences and holds honorary degrees of Doctor of Science from Norwich Univeristy and Doctor of Engineering from the Illinois Institute of Technology.

The Spirit of St. Louis Medal, established by an endowment fund created in 1929 by citizens of St. Louis, Mo., is awarded for meritorious service in the advancement of aeronautics.

ERNEST L. ROBINSON

MELVILLE MEDAL, 1944

The 1944 Melville Prize Medal for original work has been awarded to Ernest L. Robinson for his paper entitled "Bursting

Tests of Steam-Turbine Disk Wheels." Articles reporting research work carried out by Mr. Robinson have been appearing in the A.S.M.E. and other technical publications for some years. Most of the work has been carried on at the General Electric Company, Schenectady, with whose turbine engineering department he has been associated since 1919. He holds a number of patents relating to steam turbines. The Charles A. Coffin Award was presented to him by the General Electric Company in 1933 "in recognition of the important contributions made . . . in designing buckets for steam turbines."

Mr. Robinson, who was born in 1890, received a B.A. degree from St. Lawrence University in 1911 and spent the next three years at the Harvard Graduate School of Applied Science, which granted him an M.C.E. degree in 1914. He was connected with structural-steel fabrication from then until he entered the United States Army in May, 1917. He was commissioned a first lieutenant, Engineers, and held the rank of captain when he left the service in 1918. St. Lawrence University conferred an Sc.D. degree upon him in 1940.

A member of the A.S.M.E. since 1923, Mr. Robinson has rendered valuable service to the Society, particularly on boiler-code and research committees on ferrous materials, thermal properties of steam, effect of temperature on the properties of metals, and critical-pressure steam boilers.

The Melville Prize Medal for original work, established in 1914 by the bequest of Rear Admiral George W. Melville, Honorary Member and Past-President of the Society, is presented for an original paper or thesis of exceptional merit, presented to the Society for discussion and publication, to encourage excellence in papers.

EARLE BUCKINGHAM

WORCESTER REED WARNER MEDAL, 1944

The citation covering the award of the Worcester Reed Warner Medal to Earle Buckingham, professor of mechanical engineering at the Massachusetts Institute of Technology since 1925, reads as follows:

"For his original contributions to engineering literature, especially in the fields of interchangeable manufacturing and gearing, based no less on his extensive research work than on his broad experience in many fields of practical manufacturing. His group of books on gear design, production, and application are outstanding in this field of mechanical engineering."

Professor Buckingham was born in 1887, attended the United States Naval Academy from 1904 to 1906, and during the next eight years was employed successively by the American Graphophone Company, Winchester Repeating Arms Company, Veeder Manufacturing Company, Royal Typewriter Company, and Standard Manufacturing Company. Prior to the entry of the United States into World War I, he was connected with the manufacture of arms and ammunition with the Canadian Car & Foundry Co., Eddystone Ammunition Company, and Winchester Repeating Arms Company. He served as captain and major in the Ordnance Department, U.S.A., 1917–1919, after which he spent about six years with the Pratt & Whitney Division of the Niles-Bement-Pond Company before going to M.I.T.

This record shows the sources of his broad experience and the variety of equipment to the design and development of which he has contributed. His work on gears has extended to those for all purposes and of all sizes from about 0.041-in. diameter to 40-ft diameter. He has done much in the field of standardization and has rendered many years of service on the standards committees of the A.S.M.E., to which Society he has belonged since 1913, and of the Society of Automotive Engineers and the American Gear Manufacturers Association.

The Worcester Reed Warner Medal, established in 1930, provision for which was made in the will of Worcester Reed Warner, Honorary Member of the Society, is bestowed for outstanding contributions to permanent engineering literature.

CARL L. NORDEN

HOLLEY MEDAL, 1944

Carl L. Norden, who receives the Holley Medal for the invention and development of the bombsight which bears his name, and for other valuable devices, was born in 1880 in the Dutch East Indies. Following the death of his father in 1885, the family returned to Holland, and he received his early education in schools there and in Dresden and Zurich, where they later resided. After several years as an apprentice in a machine shop, he continued his education, graduating as a mechanical engineer in 1904.

Arriving in the United States the same year, he was employed at the Henry R. Worthington pump and machine works in Brooklyn and subsequently at affiliated works near Cincinnati and Buffalo. From 1906 to 1911 he was with the J. H. Lidgerwood Manufacturing Co., Brooklyn, designing special equipment. He then joined the Sperry Gyroscope Company, to design the first gyrostabilizing equipment for ships. He established himself as consulting engineer in Brooklyn in 1915 and designed many instruments and devices, including robot flying bombs, radio-controlled target airplanes, and the catapults and arresting gears for the aircraft carriers *Saratoga* and *Lexington*. These were the first hydraulically-controlled landing gears.

In 1921 the Bureau of Ordnance of the United States Navy entrusted Mr. Norden with the study of the precision-bombing problem and in 1927 he developed a practical timing sight, incorporating optics directly stabilized on three axes, reducing radial errors to one sixth of those of the then existing naval sights.

The firm of Carl L. Norden was incorporated in 1928. Since then Mr. Norden has designed several models of a precision synchronizing bombsight, augmented by special automatic flight-control equipment operated by the sight, also glide bombing equipment, automatic erectors, dive sights, and the mechanical features of radar sights and equipment.

The Holley Medal was instituted and endowed in 1924 by George I. Rockwood, past vice-president of the Society, to be bestowed for some great and unique act of genius of engineering nature that has accomplished a great and timely public benefit.

EDWARD G. BUDD

A.S.M.E. MEDAL, 1944

The A.S.M.E. Medal is awarded to the president of the Edward G. Budd Manufacturing Co., Philadelphia, primarily for the development of stainless-steel railway passenger cars.

Mr. Budd was forty-two years old when he organized the company in 1912. He had served an apprenticeship at the Niles-Bement-Pond Company, attended The Franklin Institute, and risen to be general manager of the Hale & Kilburn Co., manufacturers of seats for railroad cars. He had been substituting steel for cast iron for such seats, and the manufacture of steel truck bodies was one of the Budd Company's first undertakings. Steel passenger-car bodies was the next step and started the company on the road to prosperity.

During World War I the metalworking facilities of the company were devoted to the manufacture of helmets, field kitchens, army truck bodies, bombs and shells, and other war material. Following the war, Mr. Budd expanded the manufacture of the all-steel automobile body, and also the steel automobile wheel. The Budd Wheel Corporation, first organized in Philadelphia in 1916, was reorganized in 1921 as the Budd Wheel Company, with its own plant in Detroit. Mr. Budd is its president.

The development of a system for fabricating stainless steel by controlled resistance welding was closely followed by the manufacture in 1931 of the first stainless-steel airplane. Then came the building of lightweight stainless-steel truck trailers and streamlined lightweight stainless-steel railroad trains. The first of these famous trains, the "Pioneer Zephyr," was de-

livered to the Chicago, Burlington- & Quincy R.R. in 1934; the last, the "Empire State Express," was commissioned by the New York Central on December 7, 1941.

Now the company is again engaged to its full capacity in the production of wartime equipment for every branch of the service, finding many uses for stainless steel under the pioneering leadership of its founder.

The A.S.M.E. Medal, established by the Society in 1920, is presented for distinguished service in engineering and science.

CHARLES M. ALLEN

HONORARY MEMBERSHIP, 1944

At the A.S.M.E. Annual Meeting in 1936 the Society presented the Warner Medal to Charles M. Allen "for his early and continued hydraulic-laboratory work and for the permanent value of the papers on his development of methods of testing large hydraulic turbine installations." The Franklin Institute has recognized his contribution to the field of hydraulics by awarding him the Elliott Cresson Medal for 1943. The Boston Society of Civil Engineers, of which he is a past-president, and the American Society of Civil Engineers have also conferred awards upon him.

A native of Walpole, Mass., where he was born in 1871, he chose to attend the Worcester Polytechnic Institute and holds the B.S., M.S., and honorary Doctor of Engineering degrees from that institution. He has served continuously on its faculty since 1894. At the pioneer hydraulic laboratory established by George I. Alden, long a professor and trustee of the Institute, Professor Allen has carried on research work in power and water measurement and hydraulic model testing.

The salt velocity method of measuring water, described in a paper in the A.S.M.E. Transactions in 1923, is perhaps the most important of Professor Allen's inventions. He has also invented an oarsman's recorder and a turbine flow recorder, and has done valuable research work in connection with the friction of gears. His knowledge has been disseminated not only as a teacher, but as a consultant and writer.

Professor Allen has held membership in the A.S.M.E. since 1901, was made a Fellow in 1936, and has served the Society in the offices of manager and vice-president, and on several committees, especially in the Power and Hydraulic Divisions. The conferring of honorary membership upon him is in recognition both of his loyalty to the Society and his achievements as an engineer.

LEVIN H. CAMPBELL, JR.

HONORARY MEMBERSHIP, 1944

Major General Levin H. Campbell, Jr., Chief of Ordnance of the United States Army, was graduated from the U. S. Naval Academy in 1909 at the age of twenty two, turned to industrial work for two years, and then entered the Army. Service in the Coast Artillery Corps took him to the Panama Canal in the autumn of 1915. A year after the United States entered World War I he was ordered to the Office of the Chief of Ordnance, where he engaged in the engineering development of self-propelled mounts and ordnance automotive vehicles.

After the war he was sent to Stockton, Calif., to study artillery matériel production at the Holt Manufacturing Company. Subsequently he was proof officer at the Aberdeen Proving Ground for a time, then was at the Rock Island Arsenal from 1923 to 1926 and again from 1930 to 1935, with an intervening tour of duty in Washington. At Rock Island he inaugurated manufacturing techniques in the production of gun carriages and self-propelled fighting vehicles which were of great advantage to the work of the arsenal.

At Frankford Arsenal, where he was stationed from 1935 to 1940, General Campbell revolutionized the art of artillery ammunition production in several of its important phases, including the machining of shell, the manufacture of cartridge cases, and the production of mechanical time fuses.

He was recalled to Washington in the summer of 1940 and soon placed in charge of the Development of Facilities, Office of the Chief of Ordnance, responsible for the direction of the vast program for the building of ordnance plants throughout the country, particularly for the production of chemicals and explosives, and the loading of ammunition. The mounting curves showing the production of weapons are, in themselves, a tribute to his engineering genius and administrative talents. He became Chief of Ordnance in June, 1942, with the rank of major general.

General Campbell was elected a member of the A.S.M.E. early in 1944.

GANO DUNN

HONORARY MEMBERSHIP, 1944

Although he takes a notable place among engineers as president, since 1913, of the J. G. White Engineering Corporation, Gano Dunn is recognized as well for his services to the advancement of science and art, to technical education, and to the country in peace and in war.

Born in 1870, he earned the degrees of B.S. and M.S. from the College of the City of New York and E.E. from Columbia University, and rose to the position of vice-president in the Crocker-Wheeler Company before becoming associated with the White organization in 1911.

So numerous have been the affiliations through which Dr. Dunn has devoted himself to his profession and to public service that they may not all be mentioned here. He has been president of the American Institute of Electrical Engineers and of the United Engineering Trustees, Inc.; chairman of The Engineering Foundation and the National Research Council; president of the Cooper Union for the Advancement of Science and Art; delegate to international electrical congresses, Pan-American scientific congresses, and the World Power Conference of 1936. He was appointed by the President in 1939 as a member of the committee to study methods of selecting personnel for professional positions in the government service; was also appointed to the Science Advisory Board; and has been a member since its beginning of the Business Advisory Council for the Department of Commerce. He was appointed to the National Defense Commission in 1940 as senior consultant on industrial materials and has also served as special consultant to the Production Division of the Office of Production Management as well as on the New York City Housing Authority.

Dr. Dunn holds honorary Doctor of Science degrees from Rutgers and Columbia universities and has been presented with a number of other honors, including the Edison and Hoover medals. He is a fellow of the A.S.M.E., which he joined in 1911.

EMORY S. LAND

HONORARY MEMBERSHIP, 1944

In conferring honorary membership upon Vice Admiral Emory S. Land, U.S.N. (Retired), the A.S.M.E. recognizes his extensive and notable accomplishments in naval construction and aeronautics over a period of more than forty years.

A graduate of the U. S. Naval Academy in 1902, he rose to the rank of rear admiral in 1932 and was advanced to vice admiral in 1944. His work during World War I won him the Navy Cross "for distinguished service . . . in connection with the design and construction of submarines and for work in the war zone," as well as several other decorations.

Following the war he was assistant naval attaché at the American embassy in London for two years and subsequently was transferred from the Bureau of Construction and Repair to the Bureau of Aeronautics. He served as assistant chief of this bureau from 1926 to 1928 and then, on leave from the Navy,

spent two years as vice-president and treasurer of the Daniel Guggenheim Fund for the Promotion of Aeronautics.

After his return to active Navy duty he was again connected with construction and repair work until retired as chief of that bureau in 1937. Immediately following his retirement Admiral Land was appointed to the U. S. Maritime Commission and assigned to its construction program. He succeeded Joseph P. Kennedy as chairman of the Commission in 1938 and has given valuable administrative direction to the expansion of construction and training of increased personnel to meet war requirements.

Admiral Land, born in 1879, was graduated from the University of Wyoming prior to entering the Naval Academy, and later received an M.A. and an honorary LL.D. degree from the university. Also, he took an M.S. degree at the Massachusetts Institute of Technology for a course in naval architecture. He was president of the Society of Naval Architects and Marine Engineers for two years and has been given presidential appointments on several wartime shipping agencies.

SIR (STANDEN) LEONARD PEARCE
HONORARY MEMBERSHIP, 1944

Sir (Standen) Leonard Pearce, engineer in chief of the London Power Company, has been associated with that organization since 1926. As a background for this important post he held positions with the British India Steam Navigation Company, the Metro-Electrical Supply Company, the British Thomson-Houston Company, and the Central Railway Company. He became deputy chief electrical engineer of Manchester in 1901 and chief electrical engineer three years later and was consulting and chief engineer and manager of the Electricity Department of the Manchester Corporation from 1904 to 1925. He was electricity commissioner, London, 1925–1926, and has held that office again since 1940.

He has rendered service in the Manchester Section of The Institution of Electrical Engineers and Institution of Civil Engineers, is a past-president of the Junior Institution of Engineers and the Incorporated Municipal Electrical Association, and is an honorary member of The Institution of Mechanical Engineers. He is a Fellow of the American Institute of Electrical Engineers.

He was born in 1873 and secured his technical training at the Finsbury Technical College. He was made a commander of the Order of the British Empire in 1919 and knighted in 1935.

GANTT MEDAL PRESENTATION

In addition to the A.S.M.E. Medals presented at the 1944 Annual Meeting, the Gantt Gold Medal was conferred upon Lillian M. Gilbreth and (posthumously) Frank B. Gilbreth. Wallace Clark, member A.S.M.E., chairman of the Gantt Medal Board of Award, made the presentation.

The Gantt Gold Medal was established in 1929 through a fund raised by a group of Henry Laurence Gantt's friends, to memorialize the achievements of this great management engineer, industrial leader, and humanitarian. The medal may be awarded annually for "distinguished achievement in industrial management as a service to the community," by a board made up of representatives of The American Society of Mechanical Engineers and the American Management Association.

Dr. Lillian M. Gilbreth and Dr. Frank B. Gilbreth (posthumously) have been awarded the 1944 Gantt Gold Medal "in recognition of their pioneer work in management, their development of the principles and techniques of motion study, their application of those techniques in industry, agriculture, and the home, and their work in spreading that knowledge through courses of training and classes at universities."

Frank B. Gilbreth, a member of the A.S.M.E. for more than twenty years, died in 1924 at the age of fifty six. A contractor and construction engineer responsible for many large-scale jobs, his motion studies brought him in contact with Frederick W. Taylor. Profoundly impressed by the principles of management set forth by Taylor, he left the construction field to devote all his time to management, both as a consultant and research worker.

Associated with him in much of his work was Mrs. Gilbreth, a graduate of the University of California in 1900. She has continued their activities as a consultant in management and is professor of management at Purdue University. Joint author with her husband of several books on time, fatigue, and applied motion studies, and on motion study for the handicapped, she has added other valuable articles to such literature, and recently collaborated with Edna Yost in a book on "Normal Lives for the Disabled."

Major Gilbreth served in the Corps of Engineers during World War I, developing methods of training soldiers in the operation of machine guns and similar mechanisms which greatly reduced the time necessary to put men in the field, and these methods were applied by him later in the rehabilitation both of crippled soldiers and the industrially crippled.

Both Gilbreths have received honorary degrees and other forms of recognition of their contributions to the science of management. In conferring the Gantt Medal upon them, the American Management Association and The American Society of Mechanical Engineers, in both of which Mrs. Gilbreth holds membership, likewise pay tribute to their fundamental and enduring services in this field.

PRESENTATION OF HOOVER MEDAL

Scott Turner, chairman of the Hoover Medal Board of Award, made the presentation of the Hoover Medal for 1944 to Ralph E. Flanders, past-president, A.S.M.E.

"Engineer, industrialist, humanist, whose faith in his fellowmen and devotion to human well-being as exemplified by effective public service and inspired leadership, have led to the award of the Hoover Medal for 1944."

This citation accompanying the award to Ralph E. Flanders is barely indicative of the scope of his services and the breadth of his influence. Early experience in machine design and construction was followed by four years as associate editor of *Machinery*. He entered the employ of the Jones & Lamson Machine Co., Springfield, Vt., in 1912, at the age of thirty two and rose to the presidency of the company in 1933, after having served it as general manager for many years. He is regarded as a national authority on machine design and construction, especially on the engineering problems of screw threads and thread grinding.

During these years Mr. Flanders devoted a great deal of time and effort to the welfare of his profession. While a delegate to the American Engineering Council he was active in its public-works program and it was during the 20's that he began to express his thinking on current economic problems in addresses before engineering organizations. His grasp of the basic industrial and economic problems led to his appointment on the government's Industrial Advisory Board, Business Advisory and Planning Council, and Board of Economic Stabilization. He has also served as group administrator of Machinery Priorities, Office of Production Management, and is president of the New England Council. In May, 1944, he was granted a leave of absence from the Jones & Lamson Machine Company to serve as president of the Federal Reserve Bank of Boston.

The A.S.M.E., to which Mr. Flanders has belonged since 1908, made him a fellow in 1936; it gave him the Worcester Reed Warner Medal in 1934 and elected him president in 1935. A number of educational institutions have conferred degrees upon him. Through the presentation of the Hoover Medal his "devotion to the development of a richer and more enduring

civilization" is recognized by the national engineering societies representing his profession.

The Hoover Medal, founded in 1929, was instituted to commemorate the civic and humanitarian achievements of Herbert Hoover, and the first award was made to him in 1930. The trust fund creating the award is the gift of Conrad N. Lauer, of Philadelphia. It is held by The American Society of Mechanical Engineers and is administered by a Board of Award consisting of representatives of the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, and the American Institute of Electrical Engineers.

THE PRESIDENT'S SPEECH

After the awards and honorary memberships had been conferred, Mr. Batt introduced R. M. Gates, President of the Society, who was received with applause.

Mr. Gates said that he was not going to read his presidential address. He had, he said, been interested in education for many years and had talked on the subject with such men as Dean A. A. Potter, of Purdue, President Harvey N. Davis of Stevens, and President Robert E. Doherty of Carnegie Institute of Technology. As for himself, he was critical of education and had asked himself what the A.S.M.E. could do to help its members be of service to the nation. Some of his ideas were incorporated in the address he had prepared and the address, he said, would be available, for all to read. It was his hope that men in industry who were interested in education would read the address which was, on that occasion, being "presented by title." (The complete address will be found on pages 5 to 8 of this issue.)

Mr. Gates thanked the members and committeemen who had served during his term of office for their assistance to him in the administration of the Society's activities during the year, and expressed his gratitude to all who had made his visits to the sections and student branches enjoyable experiences.

After Mr. Gates's brief talk, Mr. Batt introduced the President-Elect of the Society, Alex D. Bailey. Mr. Bailey thanked members of the Society, on behalf of himself and newly elected members of the Council, for the confidence they had placed in him. Being president of the Society was a great honor which came to few, he said. The Society, in his opinion, had been slow to recognize Chicago as a source of presidential material. Before him Chicago had provided, as presidents, Robert Woolston Hunt (1891), William Lamont Abbott (1926), and Charles Piez (1930).

The engineering profession, he said, had made the world a better place to live in. Engineers had been interested in more than technology and economics; they had also been interested in humanity itself, and the Society had offered an organization through which these interests could be carried forward.

Mr. Bailey's greetings were met with applause and Mr. Batt then introduced the newly-elected members of the A.S.M.E. Council, Messrs. David Larkin, John E. Lovely, and Thomas S. McEwan, vice-presidents, and Daniel S. Ellis, Arthur J. Kerr, and Herman G. Thielscher, managers. All were present except Mr. Kerr and rose to greet the applause of the audience.

Mr. Batt closed the dinner meeting with a few extemporaneous remarks, after which a reception was tendered the presidents and their wives, Mr. and Mrs. Robert M. Gates and Mr. and Mrs. Alex D. Bailey. Dancing followed in the Georgian Room.

A.S.M.E. ANNUAL BUSINESS MEETING

The Annual Business meeting of the A.S.M.E. was held in the Hotel Pennsylvania, Monday afternoon, November 27. President Gates presided.

REPORTS

Reports of the A.S.M.E. Council and of the Standing Committees and Joint Activities of the Society were presented for the record by Secretary Davies. The Secretary also read into the record the names of members admitted during the year and a list of members who had died during the year. By vote of members at the meeting the Report of the Council was accepted.

K. W. Jappe, chairman of the Finance Committee, then read the report of that committee, which was accepted.

Erik Oberg, former Treasurer of the Society, complimented the Finance Committee on its report.

TELLERS OF ELECTION

The Secretary read the official report of the tellers of election of officers of the Society for 1944-1945.

NOMINATING COMMITTEE FOR 1945

S. R. Beitler, chairman of the Committee on Local Sections, read the names of the Nominating Committee for 1945, presented by the regional delegates. The list, which was approved, is as follows:

GROUP I:

Fred C. Richardson, Westcott and Mapes, 139 Orange St., New Haven 5, Conn.
G. A. Orrok, first alternate, Boston Edison Co., 39 Boylston St., Boston, Mass.

GROUP II:

W. H. Larkin (*chairman*), B. F. Sturtevant Co., 420 Lexington Ave., New York, N. Y.
H. E. Martin, first alternate, Babcock and Wilcox Co., 85 Liberty St., New York 6, N. Y.
J. H. Sengstaken, second alternate, The Western Precipitation Corp., 405 Lexington Ave., New York 17, N. Y.

GROUP III:

M. C. Stuart, Lehigh University, Bethlehem, Pa.
Henry L. Mason, first alternate, Taylor Instrument Co., Box 110, Rochester 1, N. Y.
Willis H. Carrier, second alternate, Carrier Corp., 300 S. Geddes St., Syracuse 1, N. Y.

GROUP IV:

J. B. Jones, Virginia Poly. Inst., Blacksburg 3, Va.
H. G. Mouat, first alternate, Whiting Corp., 544 Martin Bldg., Birmingham 3, Ala.
P. R. Yopp, second alternate, Babcock and Wilcox Co., 1203 Candler Bldg., Atlanta 3, Ga.
J. M. Tucker, third alternate, University of Tennessee, Estabrook Hall, Knoxville 16, Tenn.

GROUP V:

Ralph A. Sherman (*secretary*), Battelle Memorial Institute, 505 King Ave., Columbus 1, Ohio
W. A. Carter, first alternate, The Detroit Edison Co., 2000 2nd Ave., Detroit 26, Mich.
M. R. Bowerman, second alternate, Alliance Machine Co., Alliance, Ohio

GROUP VI:

C. F. Moulton, Nebraska Power Co., 4th and Jones St., Omaha 2, Neb.
W. W. Babcock, first alternate, Central Illinois Light Co., 316 S. Jefferson St., Peoria, Ill.
R. W. Merkle, second alternate, West. Cartridge Co., East Alton, Ill.
H. O. Croft, third alternate, University of Iowa, 122 Engrg. Bldg., Iowa City, Iowa

GROUP VII:

F. W. Candee, State College of Washington, Pullman, Wash.
E. B. Parker, first alternate, State College of Washington, Pullman, Wash.
N. W. Humphrey, second alternate, Washington Water Power Co., 825 Trent St., Spokane, Washington

GROUP VIII:

H. E. Degler, University of Texas, Austin 12, Texas

E. J. Wacker, Jr., first alternate, Magnolia Pipe Line Co., Box 900, Dallas 1, Texas

L. J. Cucullu, second alternate, New Orleans Public Service, Inc., 317 Barrone St., New Orleans 9, La.

ORDNANCE AWARD

At the request of President Gates, Col. James L. Walsh, chairman of the A.S.M.E. War Production Committee, spoke briefly of the award made to the Society by the Ordnance Department (see MECHANICAL ENGINEERING, October, 1944, page 629).

Colonel Walsh said that the award had not been earned by the War Production Committee alone but by the entire membership of the Society. Furthermore, he asserted, it had not been earned in the last few years because the Society had started earning it some twenty-three years ago when the finances of the Ordnance Department were at a low ebb and the Society, through its National Defense Committee, as it was then called, maintained active contacts with the Ordnance Department and its interests. He was confident, he said in conclusion, that in the future the A.S.M.E. would maintain a sense of scientific, engineering, and industrial preparedness without which this nation could not survive.

AMENDMENTS

From the Council the Business Meeting received several recommendations of changes in the Constitution which were approved by the meeting to be sent to the members for letter ballot. Discussion over the wording of the amendments led to one of the liveliest business meetings of recent years.

ACTS OF COUNCIL APPROVED

As a concluding matter of business the members approved the acts and transactions of the Society and the Council for the year 1943-1944.

ACTIONS OF A.S.M.E. EXECUTIVE COMMITTEE

A meeting of the Executive Committee of the Council of The American Society of Mechanical Engineers was called to order by the chairman, R. M. Gates, President of the Society, on Sunday, November 26, at the Hotel Pennsylvania. In addition to Mr. Gates there were present: W. J. Wohlberg, vice-chairman, A. C. Chick, D. W. R. Morgan, and A. R. Stevenson, Jr., of the Committee; K. W. Jappe (Finance), W. M. Sheehan (Professional Division), S. R. Beitler (Local Sections); Alex D. Bailey, president-elect, and C. E. Davies, secretary. In addition, the following members of the Council were present: J. Calvin Brown, W. G. Christy, H. V. Coes, R. F. Gagg, S. H. Graf, W. H. McBryde, Roscoe W. Morton, J. M. Robert, G. T. Shoemaker, F. L. Wilkinson, Jr., H. O. Croft, former member of the Council, also attended.

The following actions were of general interest.

PENSION PLAN FOR EMPLOYEES

A pension plan for A.S.M.E. employees, prepared by the Finance Committee, was received and transmitted to the Council.

DELINQUENT MEMBERS

The time in which payment of dues of members in arrears would be received was extended to March 1.

MEMBERS IN MERCHANT MARINE

Members of the Society in the Merchant Marine were permitted to receive the same consideration as is being given to those in the Army, Navy, and Marine Corps and the armed forces of the United Nations.

ADDITIONAL HONORS

Confirmation was voted of a letter-ballot approval of the following additional honors for 1944:

Melville Medal, to Dr. Ernest Leffert Robinson, turbine engineering department, General Electric Company, Schenectady, N. Y., for his paper, "Bursting Tests of Steam-Turbine Disk Wheels."

Spirit of St. Louis Junior Award, to Martin Goland, research laboratory, Curtiss-Wright Corporation, Buffalo, N. Y., for his paper, "The Influence of the Shape and Rigidity of an Elastic Inclusion on the Transverse Flexure of Thin Plates."

CHAS. T. MAIN AWARD FUND

Appreciation was expressed to Alice A. Main, A. W. Benoit, and M. K. Bryan for their contributions to the Chas. T. Main Award Fund.

P.T.C. COMMITTEE NO. 11 ON FANS

On the recommendation of the Power Test Codes Committee, authorization was voted of the setting up of Individual Committee No. 11 on Fans, with the following personnel: M. C. Stuart, Theo. Baumeister, C. A. Booth, W. H. Carrier, Thos. Chester, E. D. Curley, S. H. Downs, J. J. Grob, H. F. Hagen, F. H. Jenkins, R. D. Madison, L. S. Marks, W. W. Lawrence, and B. K. Erdoss.

DEVELOPMENT FUND

Confirmation was voted of letter-ballot approval of the following statement of purpose of the Development Fund:

The Development Fund has been established as a separate fund of the Society, expenditures from which will be made by the Council for projects designed to broaden the knowledge of engineers and to make available engineering data that will improve the practice of engineering and aid the industries which for their permanence and future development depend on a high degree of engineering skill.

CERTIFICATES OF AWARD

Requests were granted for certificates of award to the following: Frank L. Bradley, Committee on Publications; Lewis K. Sillcox, Committee on Meetings and Program; Samuel H. Libby, Committee on Admissions; Professional Divisions: A. W. Thorson, Fuels; R. A. Bowman, Heat Transfer; G. E. Hagemann, Materials Handling; H. E. Degler, Oil and Gas Power; Theo. Baumeister, Power; Sol Einstein, Production Engineering; Gordon M. Kline, Rubber and Plastics; M. J. MacDonald, Wood Industries.

A.S.R.E. FORTIETH ANNIVERSARY

Greetings and best wishes of the Society were extended to The American Society of Refrigerating Engineers upon its fortieth anniversary, Dec. 10–11, 1944.

DEATHS REPORTED

The Committee noted with regret the death, on October 1, 1944, of C. C. Worthington, Manager of the Society 1883–1886; and the death on Nov. 2, 1944, of Thomas E. French, chairman of the Standing Committee on Standardization.

APPOINTMENTS

The following appointments were approved: Metals Engineering Division, J. J. Kanter (1948); Subcommittees of Boiler Code, Unfired Pressure Vessels, K. V. King, Nonferrou Materials, F. W. Davis, Power Test Code Committee No. 3 on Fuels, Louis Shnidman; Power Test Codes Special Committee of Council, Alfred Iddles, Chairman, E. B. Ricketts, Ronald B. Smith; Gantt Medal Board of Award, Lawrence A. Appley (four years); National Management Council, J. M. Juran, representative, L. A. Appley, alternate (three years).

A.S.M.E. COUNCIL MEETS

Three sessions of the A.S.M.E. Council were held during the 1944 Annual Meeting. The first session was held at the Hotel

Pennsylvania on Sunday afternoon, November 27. President R. M. Gates presided, and there were present H. V. Coes, W. A. Hanley, W. H. McBryde, and J. W. Parker, past-presidents; J. W. Eshelman, R. F. Gagg, D. W. R. Morgan, J. A. Noyes, G. T. Shoemaker, F. L. Wilkinson, Jr., and W. J. Wohlenberg, vice-presidents; J. Calvin Brown, A. C. Chick, W. G. Christy, S. H. Graf, T. S. McEwan, Roscoe W. Morton, J. M. Robert, A. R. Stevenson, Jr., A. E. White, Managers; C. E. Davies, secretary; Alex D. Bailey, president-elect; David Larkin and J. E. Lovely, vice-presidents elect; D. S. Ellis, A. J. Kerr, H. G. Thielscher, managers-elect; R. L. Parsell (Constitution and By-Laws), K. W. Jappe and G. L. Knight (Finance); S. R. Beitler (Local Sections); W. M. Sheehan (Professional Divisions); J. L. Lewis and J. W. Simonson (Junior observers); H. H. Snelling, guest; and R. L. Sackett and G. A. Stetson of the staff.

The second session of the Council was held at the Hotel Pennsylvania, Monday morning and afternoon. A few persons present at the Sunday session were absent from the second session, and the following additional persons were present: J. R. Younger (Aviation Division), C. L. Bausch and L. W. Wallace (Board of Honors and Awards), S. D. Moxley (Local Sections); E. J. Nobles and E. S. Rowell, Jr. (Junior observers); W. W. Babcock, H. C. R. Carlson, R. W. Flynn, J. R. Hicks, B. T. McMinn, F. W. Miller, R. G. Roshong, R. M. Scott, H. L. Solberg, E. E. Williams, and P. R. Yopp (Section Delegates); and L. W. Bass, W. L. Edel, L. E. Jermy, and I. Melville Stein, guests.

The following actions of general interest were taken at the Monday sessions of the Council:

ANNUAL REPORT

The annual report of the Council (see pages 39–43 of this issue) and the reports of the standing and special committees and representatives on joint activities (available on request) were adopted.

The annual report of the Woman's Auxiliary, A.S.M.E., was accepted and the thanks of the Council were extended to the Auxiliary with sincere appreciation for its achievements.

RICE LECTURERS

Life membership was conferred on Rodolfo E. Ballester, of Buenos Aires, Argentina, and Adolf Meyer, of Baden, Switzerland, both nonmember Rice Lecturers.

1945 FALL MEETING

The invitation of the Cincinnati Section to hold the 1945 Fall Meeting in that city, October 1–3, was accepted.

CANONS OF ETHICS

Upon recommendation of W. F. Ryan, who had made a thorough study of the proposed Canons of Ethics for engineers prepared by a committee of E.C.P.D., the Council voted to approve the canons as an essential step toward unity of aims and purposes. It was understood that corrections to the Canons could be made by due process as agreement was reached among the constituent bodies of E.C.P.D.

It was further voted that the suggestion of the American Institute of Consulting Engineers, to the effect that the Canons be rearranged and reworded, be seconded, and that the gradual and well-considered expansion and refinement of the Canons be recommended to (*a*) cover more specifically problems of conduct that arise in the professional life of the employed engineer; (*b*) define more definitely the duties of engineers to subordinates; (*c*) broaden the definitions of "unfair competition;" (*d*) define engineering ethics clearly and completely and develop so strong a professional consciousness among engineers that it will become unprofitable for any organization or agency to suppress or distort honest and competent engineering conclusions for commercial or political reasons.

The Council further announced its interest in broader objectives than those that are covered in the present draft and instructed A.S.M.E. representatives on E.C.P.D. to work through proper channels and by due process for the ultimate attainment of these objectives.

CONSTITUTION AND BY-LAWS

Amendments to B4, Pars. 4–7 (qualifications for admission) and B6A, Par. 19 (standing and special committees) were adopted.

Proposed amendments to the Constitution, relating to the Council and the election of directors, were submitted to the Business Meeting of the Society. The final amendments, as approved at the Business Meeting, will be submitted to the membership for letter ballot. Other proposed amendments relating to membership, qualifications for admission, and fees and dues were also submitted to the Business Meeting. These amendments will be submitted to the membership for letter ballot.

STATUS OF ENGINEER

I. Melville Stein, chairman of the Joint Committee on Status of the Engineer, explained briefly the general content of a proposed manual of an informative nature on "collective bargaining," the preparation of which has had the approval of the Joint Conference Committee of Presidents and Secretaries of the Founder Societies.

The Joint Committee is planning (*a*) to conduct a survey on salaries by direct approach to individual members and a survey on policy of industry relating to engineers by direct approach to employers; and (*b*) to secure the services of a consultant for analysis of member and employer surveys.

L. W. Bass, president-elect of the American Institute of Chemical Engineers, reported on the methods used and the results obtained in the 1941 to 1943 surveys on the economic status of the members of the American Chemical Society.

CONCLUDING SESSION OF THE COUNCIL

The concluding session of the 1944 Council was held in the rooms of the Society on Friday morning. President Gates presided. There were present, in addition to Mr. Gates, H. V. Coes and W. H. McBryde, past-presidents; J. W. Eshelman, R. F. Gagg, J. A. Noyes, and G. T. Shoemaker, vice-presidents; J. Calvin Brown, A. C. Chick, W. G. Christy, S. H. Graf, T. S. McEwan, Roscoe W. Morton, J. M. Robert, and A. E. White, managers; C. E. Davies, secretary; Alex D. Bailey, president-elect; David Larkin and J. E. Lovely, vice-presidents elect; D. S. Ellis and H. G. Thielscher, managers elect; A. M. Gompf (Constitution and By-Laws), K. W. Jappe and G. L. Knight (Finance), S. R. Beitler, J. A. Keeth, and S. D. Moxley (Local Sections), F. G. Switzer (Meetings and Program), W. H. Larkin (Nominating), Alfred Iddles (Power Test Codes Special Council Committee), J. H. Sengstaken and W. M. Sheehan (Professional Divisions), E. J. Kates (Publications), G. L. Sullivan (Relations With Colleges), W. H. Hill (Standardization), H. C. R. Carlson and G. H. Woelbing (Sections Delegates), Frederick Marich and J. M. Sexton (Junior observers); R. M. Beanfield, E. O. Bergman, and R. F. O'Mara, guests; Ernest Hartford, executive assistant secretary; and R. L. Sackett and G. A. Stetson of the staff.

STAFF

In recognition of twenty-five years of service to the Society as members of the Headquarters Staff, the Council expressed its sincere appreciation to Joseph M. Clark, Vina E. Jillson, Mae R. Lenen, Edna M. Murrayes, and Mabel C. Smith. Colonel Davies presented these members of the Staff to the Council and Mr. Gates greeted each one of them personally.

SECRETARY'S REPORT

The Secretary summarized briefly a report pointing out some

future problems of the Society, which was accepted with thanks and appreciation. The Council also expressed its appreciation of the loyal and intelligent leadership and services of the Secretary.

CONSTITUTION AND BY-LAWS

In view of the fact that certain changes in the Constitution were to be submitted to the membership for approval by letter ballot, certain changes in the By-Laws were presented for first reading.

DEVELOPMENT FUND

It was reported that the Committee on Development Fund had made substantial progress in its preliminary program.

POWER TEST CODES

A report by Alfred Iddles, chairman of the Power Test Codes Special Council Committee, urged that provision be made in the budget and additional staff be employed as soon as possible to maintain the quality of the Power Test Codes. The report was referred to the incoming Council.

SOCIETY ORGANIZATION

The report of the Committee on Society Organization Structure, as revised, was accepted by the Council.

GROUP DELEGATES CONFERENCE

Actions and recommendations of the 1944 Group Delegates Conference were summarized by H. C. R. Carlson, speaker of the Conference. The report of the Conference was received with expressions of thanks, and the recommendations were referred to the Society committees concerned for appropriate action and report to the incoming Council. (A report of the Delegates Conference will be found on pages 70–71 of this issue.)

SIX MEMBERS OF THE COUNCIL RETIRE

At luncheon, December 1, Mr. Gates presented certificates of award for services to the Council to six retiring members of the Council: Alexander G. Christie, Joseph W. Eshelman, Guy T. Shoemaker, Walter J. Wohlenberg, William G. Christy, and J. Calvin Brown.

ALEX D. BAILEY HEADS NEW COUNCIL

Following the adjournment of the 1944 Council on December 1, Mr. Gates introduced the newly elected members of the Council: Daniel S. Ellis, Arthur J. Kerr (not present), and Herman G. Thielscher, managers; David Larkin, John E. Lovely, and Thomas S. McEwan, vice-presidents; and Alex D. Bailey, president.

The president's gavel was presented to Mr. Bailey who then took the chair. The Council voted its appreciation of Mr. Gates's leadership.

APPOINTMENTS OF SECRETARY AND TREASURER

C. E. Davies was reappointed Secretary of the Society.

K. W. Jappe was appointed Treasurer of the Society to fill the office made vacant by the resignation of W. D. Ennis.

Joseph L. Kopf was appointed Assistant Treasurer.

Thanks and appreciation to W. D. Ennis for his services to the Society was voted by the Council.

EXECUTIVE COMMITTEE

The Executive Committee of the Council was appointed as follows: Alex D. Bailey, chairman, R. F. Gagg, D. W. R. Morgan, A. R. Stevenson, Jr., and Alton C. Chick.

APPOINTMENTS

Appointments on continuing committees and representatives on joint activities were confirmed. (The names of the new committeemen will be included in the Society Records, Part 1—Committee Personnel, to be issued in February.)

COMMITTEES

The Council reviewed the entire list of special committees and voted to continue some and to discharge others with thanks.

1945 ANNUAL MEETING

Approval was voted of the recommendation of the Committee on Meetings and Program that the 1945 Annual Meeting be held at the Hotel Pennsylvania during the week of November 26.

SOCIETY ORGANIZATION

The final report of the Committee on Society Organization and Structure was adopted.

PROFESSIONAL DIVISIONS

The Council approved inviting the Mechanical Division of the American Association of Railroads, the Coal Division of the A.I.M.E., and the International Railway Fuel Association to co-operate with the A.S.M.E. Fuels and Railroad Divisions in a joint session, to be held in Chicago, June, 1945, on the subject of solid fuels in railway motive power.

A.S.M.E. LECTURESHIPS

The Council voted to extend to Dr. Marks and Dr. Timoshenko sincere appreciation for the lectures delivered by them before the Sections of the Society.

TECHNICAL COMMITTEE PARTICIPATION

Following their practice of previous years the A.S.M.E. technical committees scheduled 35 committee meetings and conferences during the 1944 Annual Meeting. In addition the research group sponsored jointly with professional divisions or alone nine of the 58 technical sessions. The standing Committee on Safety followed suit with one technical session to its credit.

RESEARCH GROUP

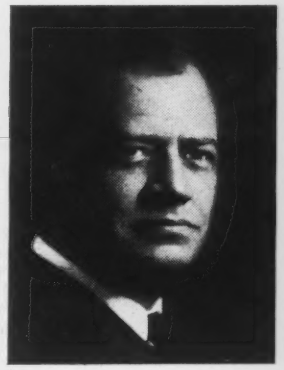
The Special Research Committee on Fluid Meters led off on Monday morning with a well-attended meeting at which Chairman R. J. S. Pigott presided. The following morning, Tuesday, the committee sponsored a technical session jointly with the Industrial Instruments and Regulators Division. Three papers were presented at this session. The first was entitled "The Coefficients of Herschel Type Cast-Iron Venturi Meters," by W. S. Pardoe; the second entitled "Piping Arrangements for Acceptable Meter Accuracy," by R. E. Sprenkle; and the third, "Remarks on On-Off Control in Resistor-Type Furnaces," by Victor Paschkis. Everett S. Lee presided at this session and J. R. Carlton acted as recorder.

Tuesday morning the Special Research Committee on Lubrication held its regular annual meeting with Chairman Burt L. Newkirk in the chair and Secretary S. J. Needs as recorder. That evening in the Georgian Room the committee sponsored a technical session. The subject was "Lubrication." W. E. Campbell served as chairman and M. D. Hersey as recorder. The following three papers were read: "Rotating-Load Bearings," by A. F. Underwood; "Lubrication Characteristics of Involute Spur Gears," by Ernest K. Gatcombe; and "Some Thermal Effects in Oil-Ring Journal Bearings," by R. A. Baudry.

The Research Committee on Condenser Tubes, Dr. A. E. White, chairman, held its annual Luncheon Meeting on the McAlpin Roof on Tuesday.

This was followed in the afternoon by meetings of two other research committees; the Committee on Critical-Pressure

W. D. ENNIS
Treasurer, 1935–1944



K. W. JAPPE
Treasurer, 1944-1945

J. L. KOPF
Assistant Treasurer, 1944-1945

Steam Boilers, H. L. Solberg, chairman, and the Committee on Cutting Fluids, Dr. O. W. Boston, chairman.

The last named of these committees in co-operation with the Research Committee on Metal Cutting Data and Bibliography, Dr. M. Martellotti, chairman, sponsored three technical sessions on Thursday. W. C. DeGraff presided at the morning session and M. E. Lange served as recorder when the following three papers were presented: "Tool Control Practiced at Puget Sound Navy Yard," by W. E. Ainsworth; "Diamond Cutting Tools," by Paul Grodzinski; and "Survey on Tipping of Tools for Purpose of Conservation of Cutting Tool Material," by Frank J. Oliver. The second session was scheduled for the afternoon of the same day at which Dr. O. W. Boston took the chair and W. W. Gilbert served as recorder. The three papers read at this session were: "New Developments Made Possible by Plunge Form and Thread Grinding and the Crush Dressing of Grinding Wheels," by W. Fay Aller; "Relation of Surface Roughness Readings to Actual Surface Profile," by Leo P. Tarasov; and "Methods of Mechanically Mounting Cutting Blades of Solid Cemented Carbide," by W. L. Kennicott.

The third session was held that evening with M. E. Lange presiding and C. L. Tutt, Jr., serving as recorder. The four papers presented at this session are as follows: "A Study of Some Fundamentals When Milling Steel With Carbides," by Fred W. Lucht; "The Influence of the Application of Cutting Fluids at Different Temperatures When Turning Steel," by O. W. Boston, W. W. Gilbert, and R. E. McKee; "Helical Taper Reamers Milled With Constant Helix Angle," by T. F. Githens; and "A Thermal Balance Method and Mechanical Investigation for Evaluating Machinability," by A. O. Schmidt, O. W. Boston, and W. W. Gilbert.

On Wednesday morning the Research Committee on Metal Cutting Data and Bibliography held its annual meeting. All day Wednesday the Research Committee on Strength of Vessels Under External Pressure, F. V. Hartman, chairman, held its meeting at the Engineering Societies Building. Beginning with a luncheon the Research Committee on Plastic Flow of Metals, A. Nadai, chairman, held its regular meeting.

Wednesday afternoon also, the standing Committee on Research, Herman Weisberg, chairman, held its annual meeting. The greater part of the business of this meeting was of a routine nature during which personnel matters having to do with the organization and functioning of the Society's 19 special research committees were discussed.

Thursday was another busy day for the research group of technical committees. Furnace Performance Factors began its meeting early in the morning under the chairmanship of A. R. Mumford. This committee had held its technical session on Tuesday evening at which the following two papers were read: "External Corrosion of Furnace Wall Tubes—(1) History and Occurrence," by W. T. Reid, R. C. Corey, and B. J. Cross, and "External Corrosion of Furnace Wall Tubes—(2) Significance of Sulphate Deposits and Sulphur-Trioxide in Corrosion Mechanism," by R. C. Corey and B. J. Cross. J. H. Harlow presided at this session and the recorder was B. A. Dmitrieff.

The Joint A.S.T.M.-A.S.M.E. Committee on the Effect of Temperature on the Properties of Metals held its annual meeting on the afternoon of Thursday. This committee planned two technical sessions for this annual meeting on the subject of "Graphitization of Steel Pipe." These sessions were held on the morning and afternoon of Friday, December 1. Chairman N. L. Mochel took the chair at both sessions and J. J. Kanter served as recorder. The following six papers were presented at these two sessions: "Graphitization of Low-Carbon Molybdenum Steels," by Howard J. Kerr and F. Eberle; "Progress Report on Graphitization of Steam Lines," by S. L. Hoyt and R. D. Williams; "Investigation of Graphitization at Detroit," by R. M. Van Duzer, Jr., I. A. Rohrig, and Arthur McCutchan; "A Study of Austenitic Welding for Control of Graphitization," by I. A. Rohrig; "Fundamental Consideration of the Problems of Graphitization of Carbon-Molybdenum Pipe in High-Temperature Steam Installations," by G. A. Timmons; and "Graphitization of Welded and of End-Quenched Carbon and Molybdenum Steels," by G. V. Smith and S. H. Brambir.

A meeting of the newly organized Special Research Committee on Internal-Combustion Engines, Lee Schneitter, chairman, was scheduled for late Thursday afternoon.

On Wednesday morning a technical session on "Boiler Feedwater Studies" was sponsored by the research committee of the same name. Chairman C. H. Fellows presided at the session and J. B. Romer, the secretary of the committee, acted as recorder. The following five papers were presented: "Silica Deposition in Steam Turbines," by F. G. Straub and Hilary A. Grabowski; "History of Potassium Treatment at Springdale Station," by L. E. Hankison and M. D. Baker; "Experience With Potassium Treatment at Windsor Station," by W. L. Webb; "Embrittlement Cracking in Waters Containing Potassium Salts," by A. A. Berk and N. E. Rogers; and "Report of she Work of Subcommittee No. 6 on Effect of Solution Compotition on the Cracking of Boiler Metal."

POWER TEST CODE GROUP

There were four technical-committee meetings of the Power Test Code group scheduled during the Annual Meeting week.

Committee No. 2 on Definitions and Values came first with a meeting Monday morning at which Chairman R. J. S. Pigott presided.

A very largely attended meeting of Committee No. 17 on Internal-Combustion Engines followed on Tuesday morning. Fifteen were present and the committee agreed on a program for the completion of the revision of the present Test Code for Internal-Combustion Engines. Chairman Lee Schneitter presided at this meeting.

That same morning, Tuesday, Committee No. 4 on Stationary

Steam-Generating Units also held an equally successful meeting. Eleven were present and chairman E. R. Fish was in the chair. This committee is completing the revision of its code known as the Test Code for Stationary Steam-Generating Units.

Twelve authorities of the United States and Canada on the testing of hydraulic prime movers attended the meeting of Committee No. 18 on Wednesday morning which was held in the library of the Ohio Society on the seventeenth floor of the Hotel Pennsylvania. S. L. Kerr, chairman of the committee, led the group through a discussion of proposed additions to the present A.S.M.E. Test Code for Hydraulic Prime Movers.

The December meeting of the standing Committee on Power Test Codes was held on Thursday afternoon. Thirty five were present and Chairman Francis Hodgkinson presided. This is the meeting which the chairmen and members of all the twenty-one technical committees are invited to attend.

A certain amount of routine business was the order of the day and then the chairman called on the chairmen of the twelve technical committees, that are now at work on the revision of their respective test codes, for reports on the progress made during the past year.

With this December meeting chairman Francis Hodgkinson completed his fifth five-year term of membership on the standing committee. During this period he has served as chairman for seven years since the death of Chairman Dr. R. H. Fernald. He requested that his name be not presented to President Bailey for reappointment, so the members of the standing committee arranged for a farewell dinner in recognition of his notable services to the power test codes activity.

DINNER TO MR. HODGKINSON, RETIRING CHAIRMAN

This dinner was held on Thursday evening. In the absence of Vice-Chairman Dr. A. G. Christie, W. A. Carter acted as master of ceremonies and P. W. Swain as purveyor of some tokens of appreciation to chairman Hodgkinson from the members of the committee. The minutes between the courses and the hour following the close of an excellent meal were enlivened by anecdotes associated with the twenty-five years of the standing committee's work. These were interspersed with many stories typical of the life of a power-testing engineer. All present greatly enjoyed this little social interlude which was marked by a spirit of good fellowship and by evidences of high regard for the retiring chairman.

STANDARDS GROUP

The standards group of technical committees held a total of fifteen meetings during the week. All of them were exceptionally well attended.

Monday morning the standing committee led off with its regular annual meeting. Its long agenda kept it in session from ten-thirty o'clock in the morning until five in the evening with a brief recess for lunch.

The committee first reviewed in detail the secretary's report on (1) projects completed during the year, (2) projects in the several stages of completion from drafts prepared by subgroups and subcommittees to vote by the members of the sectional committees and approval by the sponsor bodies. In all, the status of thirty projects which in time may become approved standards was reviewed by the committee.

Items of personnel were next on the agenda and the committee spent some time conferring on the selection of men to fill vacancies in committees caused by death and resignation. Closely related to this item of business was one having to do with appropriate action in the case of inactive projects.

Under new business the committee received a report from one of its members, Elmer J. Bryant, who had served as the leader of the American delegation of the screw-thread mission which spent six weeks in England during August and September. This report indicated that an unexpected amount of progress had been made toward unification on the eight items forming the terms of reference. Mr. Bryant stated that the Canadian delegation to the conference had presented an invitation for a similar conference in Canada during May or June of 1945.

A second item of new business of general interest was the consideration and approval of the proposal to arrange for the setting up of a committee to establish standard dimensions for blanks to be used in the production of high-speed milling cutters.

Mr. Bryant told also of the work which had been done in England toward the unification of the practices for the indication of tolerances on drawings. C. A. Gladman, who had been assigned to this investigation, presented the tentative results of his study to one session of the screw-thread conference. This so impressed the American delegates that they expressed the hope that he would come to the United States to tell his story. On November 24, 1944, Mr. Gladman presented his findings to The Institution of Mechanical Engineers in London under the title "Drawing Office Practice in Relation to Interchangeable Components."

An idea of the variety and scope of the projects covered by the fourteen technical committees which held meetings during the week will be had by a study of the following list:

1 Punch Press Tools, Technical Committee No. 9 of B5, C. D. Carter, chairman.

2 Involute Splines, Subgroup No. 1 of Technical Committee No. 13 of B5, Charles Stanard, chairman.

3 Nomenclature for Small Tools and Machine Tool Elements, Technical Committee No. 17 of B5, O. W. Boston, chairman.

4 Splines and Splined Shafts, Technical Committee No. 13 of B5, S. O. Bjornberg, chairman.

5 Tool-Life Tests for Single-Point Tools, Technical Committee No. 21 of B5, O. W. Boston, chairman.

6 Forming Tools and Holders, Technical Committee No. 10 of B5, O. W. Boston, chairman.

7 Designations and Working Ranges of Machine Tools, Technical Committee No. 6 of B5, John Haydock, chairman.

8 Integrally Forged Shaft Couplings, B49, R. E. B. Sharp, temporary chairman.

9 Machine Pins, Technical Committee No. 23 of B5, P. L. Houser, chairman.

10 Scope and Intent, Subcommittee of Sectional Committee on Code for Pressure Piping, B31, Sabin Crocker, chairman.

11 Therbligs, Process Charts and Their Symbols, D. B. Porter, chairman.

12 Plumbing Code, Subgroup of Subcommittee No. 1, A40, A. H. Morgan, chairman.

13 Small Tools and Machine-Tool Elements, Sectional Committee B5, W. C. Mueller, chairman.

14 Standardization of Gases and Gas Mixtures, E. G. Bailey, chairman.

1 Eighteen attended this meeting on punch-press tools and took part in a lively discussion of the results of the committee's work to date and plans for the immediate future.

2 This meeting was scheduled for 9:00 o'clock on Tuesday morning in advance of the regular meeting of Technical Committee No. 13 to permit the members of this subgroup to confer with Chairman Stanard on the revised proposal which was to be distributed to industry in December.

3 Dr. Boston's Technical Committee No. 17 on Nomenclature for Small Tools and Machine-Tool Elements also held a spirited meeting on Tuesday morning at which they discussed such terms as "in and out" milling, climb milling, and conventional milling.

The chairman reported that copies of the proposed American Standard for Nomenclature of Milling-Cutter Teeth had been distributed to industry for criticism and comment and that he

had reviewed all of the replies which had been received. The committee, accordingly, voted to submit a revised proposal to the members of Sectional Committee B5 for vote on approval by letter ballot.

5 This meeting was followed immediately in the same room by a meeting of the Technical Committee on Tool-Life Tests for Single-Point Tools of which Dr. Boston is also chairman. The comments on Dr. Boston's paper on this subject read at the 1943 Annual Meeting were reviewed and the committee then examined a draft of the proposed American Standard for Life Tests of Tools Made of Materials Other Than Sintered Carbides. It finally voted to present this draft slightly revised to Sectional Committee B5 for vote by letter ballot. Some thought was then given to the testing of tools tipped with sintered carbide.

6 In the absence of Chairman W. C. Mueller, who was kept at home due to illness, T. W. Ragan presided at the meeting of Technical Committee No. 10 on Forming Tools and Holders. The meeting was devoted to discussing some comments which had been received on the present American Standard for Circular and Dovetailed Forming Tool Blanks approved and published in 1943.

7 Believing that the postwar readjustments would offer many opportunities for changes in the working ranges and designations of machine tools, John Haydock, chairman, called his Technical Committee No. 6 into action at this time. He reported on his conversations with the officers and members of similar committees set up by the N.M.T.B.A. and the discussions at the meeting had to do principally with the method of co-operating with these groups.

8 The present American Standard for Shaft Couplings, Integrally Forged Flange Type for Hydro-Electric Units (B49–1932) has been under revision for some months. Good progress has been made, however, so Chairman R. E. B. Sharp and Secretary D. J. McCormack were able to present to this meeting of the subcommittee a finally revised draft of the proposed revision. This was approved for submission to the entire membership of the sectional committee.

10 The Subcommittee on Scope and Intent of the Sectional Committee on a Code for Pressure Piping, B31, met on Wednesday afternoon with Chairman Sabin Crocker in the chair. The greater part of the time was devoted to the consideration of the correlation of S-values for nonferrous materials between the A.S.M.E. Boiler Code and the American Standard Code for Pressure Piping. The committee considered also other items of business which had come before it during the past year and not finally disposed of by correspondence. It was reported that the Supplement No. 1 to the Code for Pressure Piping (B31.1–1942) had just been approved by the American Standards Association and would be published shortly.

12 A two-day meeting of the Subgroup on American Standard Plumbing Code was held in the Engineering Societies Building during Annual Meeting week. Chairman A. H. Morgan presided and sixteen members were present. The principal sections of the proposed standard code discussed were No. 11 on Storm Drains and No. 12 on Vents and Venting.

13 Thirty one attended the annual meeting of the Sectional Committee on Small Tools and Machine Tool Elements, B5, which was held on Thursday afternoon. Reports of the twenty-three technical committees were made either verbally by the chairmen who were present or through letters which had been sent to Chairman W. C. Mueller.

A proposed revision of the American Standard for Lathe Spindle Noses for Turret Lathes and automatic lathes (B5.9–1936) was discussed in detail. H. W. Fahrlander, Chairman of the N.M.T.B.A. Engineering Committee on Engine and Tool Room Lathes, conveyed the opinions and views of the members of the N.M.T.B.A. concerning a revision of this standard. The progress made by several of the Technical Committees is recorded above.

At the request of the A.S.M.E. Standardization Committee consideration was given to the need for setting up standards for high speed milling cutter blanks.

SAFETY GROUP

A considerable part of the time of the annual meeting of the standing Committee on Safety this year was given over to questions of personnel of the several sectional committees for which the Society is sponsor or joint sponsor. This meeting was held on Thursday morning, November 30.

This committee then received the report of its secretary on the status of the five safety codes for which the A.S.M.E. holds sponsorship, namely, Elevators, Dumbwaiters, and Escalators, A17; Mechanical Power Transmission Apparatus, B15; Compressed-Air Machinery and Equipment, B19; Conveyers and Conveying Machinery, B20; and Cranes, Derricks, and Hoists, B30, including Jacks.

H. W. Gabor then outlined the work which a subcommittee of the standing committee had been doing on the proposed A.S.M.E. Standard Self-Appraisal Form for Safety in Industrial Plants. The members of the standing committee have been at work on this form for some years and this year the subcommittee in charge has devoted its attention primarily to simplifying the form and reducing its bulk.

The principal item of business was the report of Chairman Zeitner on the Annual Meeting session to be held Thursday afternoon jointly with the Management Division. The standing committee had undertaken the responsibility for the program of this session so the members were interested in discussing the final details of the arrangements for the session. It can now be said that this joint enterprise was a great success.

Ernest Beck, Director of Safety, U. S. Rubber Co., presided at the session and Harry Gabor served as recorder. The program consisted of two papers and a panel discussion. The first paper entitled "What the Engineering Societies Can Do to Encourage Safety Education in Technical Schools and Colleges" was presented by its author Dr. Walter A. Cutter, administrative assistant, Center for Safety Education, New York University, New York, N. Y. The second paper entitled "Hiring Handicapped People: A Problem in Human Engineering" was presented by Michael Supa (blind), Supervisor of Physically Handicapped Personnel, International Business Machines Corporation, New York, N. Y. This is the first time in recent years that a paper has been presented orally at one of the Society's meetings by a totally blind person. Both Dr. Cutter's and Mr. Supa's papers were excellent and were well received by those present.

The panel discussion on "Training for Safe Machine Operation" was led by S. W. Mudge, director of education and training, Socony Vacuum Oil Co. The six discussion leaders were: Roy S. Bonsib, Standard Oil Co. of New Jersey, New York, N. Y.; A. G. Bugenstock, Western Electric Co., Kearny, N. J.; W. H. Hollis, Sperry Gyroscope Co., Brooklyn, N. Y.; F. C. Lillienthal, American Type Founders, Elizabeth, N. J.; Lieut. Com. F. G. Lippert, U. S. Navy Yard, Brooklyn, N. Y.; and W. H. Richardson, Air Reduction Sales Co., New York, N. Y.

On Thursday also the Executive Committee of the Sectional Committee on the Safety Code for Elevators held its quarterly meeting in the Engineering Societies Building. J. J. Matson presided in the absence of Chairman D. J. Purinton. J. A. Dickinson is its secretary.

In addition to routine business the committee elected J. J. Matson vice-chairman of the executive committee and G. H. Reppert a member of the committee. These changes were made necessary by the recent death of D. L. Lindquist.

FIFTY-EIGHT TECHNICAL SESSIONS

THIRD "INGENUITY" LUNCHEON DRAWS CROWD

In accordance with a custom established several years ago the technical sessions of the 1944 Annual Meeting opened with a luncheon on Monday noon. For the last three years the open-

ing luncheon has been sponsored by the Committee on Education and Training for the Industries and the subject this year was again the discovery and stimulation of ingenuity and invention. Addresses and discussions of the previous years were published in a pamphlet during 1944.

The 1944 program, for which the Management Division was a co-sponsor, featured two addresses, "How Far and by What Means Is It Reasonable to Hope to Stimulate Ingenuity and Invention?" by Frank B. Jewett, president, National Academy of Sciences, Washington, D. C.; and "Stimulating Discovery and Invention," by Carroll L. Wilson, consultant, National Planning Commission, Washington, D. C. President Gates presided at the luncheon.

The discussion was led by A. A. Potter, fellow and past-president, A.S.M.E., dean of engineering, Purdue University, and E. H. Armstrong, Holley Medalist, 1940, professor in the Department of Electrical Engineering, Columbia University. A. R. Stevenson, Jr., staff assistant to the vice-president, General Electric Company, Schenectady, who, as chairman of the Committee on Education and Training for the Industries in 1942 developed the general program on "ingenuity," expressed his satisfaction at the interest that had been aroused in the subject as a result of the sessions at the 1942, 1943, and 1944 Annual Meetings. Plans are being made to publish the papers and discussions at a later date.

MANAGEMENT DIVISION PARTICIPATES IN EIGHT SESSIONS

In addition to its joint sponsorship of the "ingenuity" luncheon with the Committee on Education and Training for the Industries, the Management Division participated in seven other sessions throughout Annual Meeting week.

On Monday evening the Division directed its attention to the reabsorption of returning veterans and warworkers into industry. Brigadier General William C. Rose, chief, executive services, War Manpower Commission, treated the problem from the viewpoint of the Government. Organized-labor's views were expressed by Clinton S. Golden, assistant to the president, Congress for Industrial Organizations, Pittsburgh, Pa., and management's approach was set forth by Stewart M. Lowry, director of industrial relations, Proctor and Gamble Co., Ivorydale, Ohio. The discussion was led by D. M. Mason, supervisor of research, General Personnel Division, Armstrong Cork Co., Lancaster, Pa. These papers will be found in this issue.

The subject of the Management Division's third session on Tuesday morning was new horizons for the engineer in American Industry, and the speakers were Willard T. Chevalier, publisher, *Business Week*, McGraw-Hill Publishing Co., New York, N. Y., whose address was entitled "Trends in Economic Development," and C. Scott Fletcher, executive director, The Committee for Economic Development, New York, N. Y., who presented a "Program for Industry."

At the Management Luncheon, held on Tuesday, J. M. Juran, chairman of the Division, who presided, was given a certificate of appreciation of his services to the Division. Erwin H. Schell, professor in charge of the Department of Business and Engineering Administration, Massachusetts Institute of Technology, delivered an address entitled "The Role of the Manager in the Changing World."

Opportunities for management engineers in other countries was the subject of a session on international engineering held in the ballroom on Tuesday afternoon. Wallace Clark, of Wallace Clark and Company, consulting management engineers, New York, N. Y., presided. Opportunities in Europe were discussed by Dr. W. G. Friedrich, of Czechoslovakia; in the Far East by Dr. Lee Fah Yih, China Institute in America; and in South America by George L. Bell, chief, Latin American Areas, F.E.A. Discussion was led by J. W. Roe, Dr. Lillian M. Gilbreth, and A. J. Verkozen.

The fifth session of the Management Division was held in the ballroom on Thursday evening on the subject of distribution, "the engineer's next job in industry." Fenton B. Turck, president, Turck, Hill and Co., Inc., New York, N. Y., chairman of the Management Division Committee on Distribution, had charge of the meeting. He presented a statement of the opportunities for engineers in the field of distribution before calling on the speakers to present their views.

Wm. B. Stout, head of research, Consolidated Vultee Aircraft Corporation, delivered the opening address in which he took the viewpoint that everyone was a potential consumer whose needs could be stimulated and served by distribution. The attitude of a sales executive was then presented by Lee R. Jackson, executive vice-president, Firestone Tire and Rubber Company. Gano Dunn, the third speaker, emphasized the effectiveness of the engineer's method of approach to and solution of problems. What the corporation executive thought about the need for engineers to enter the field of distribution was expressed by Morehead Patterson, chairman of the board, American Machine and Foundry Co., Inc. In the concluding discussion, W. Gibson Carey, Jr., president, Yale and Towne Manufacturing Company, urged engineers to exercise "tolerance and skepticism" in approaching such a problem as that of distribution.

Speakers at the Management Division's session on new horizons for the engineer in agriculture were John D. Black, professor of economics, Harvard University, and Marvin E. Mundel, assistant professor of industrial engineering, Purdue University. The formal discussion was led by Ladd Haystead, farm editor, *Fortune* magazine, Leonard J. Fletcher, director of training, Caterpillar Tractor Co., and Dan M. Braun, Sr., training specialist, U. S. Department of Agriculture. Professor Black said that the principal factors holding back innovations in agriculture had always been the lack of an expanding outlet for farm products and lack of alternative employment for the farm labor displaced. If city occupations will provide jobs for all the farm workers who will want them in the next ten years, he asserted, labor-saving equipment will be introduced rapidly.

Jointly with the Safety Committee, the Management Division held a session on Thursday afternoon on the subject of safety. Two papers were presented, "Education for Safety—What the Engineering Societies Can Do to Encourage Safety Education in Technical Schools and Colleges," by Walter A. Cutter, Center for Safety Education, New York University (See MECHANICAL ENGINEERING, December, 1944, pages 810–812), and "Hiring Handicapped People: A Problem in Human Engineering," by Michael Supa, supervisor of physically handicapped personnel, International Business Machines Corporation.

The papers were followed by a panel discussion, led by Sterling W. Mudge, director of education and training, Socony Vacuum Oil Company, on "Training for Safe Machine Operation."

The concluding session of the Management Division was held jointly with the Materials Handling and Production Engineering Divisions. R. W. Mallick of the Westinghouse Electric and Manufacturing Company, presented a paper entitled "Three-Dimensional Planning—New Trends in Industrial-Plant Layout," which appeared in the December issue of MECHANICAL ENGINEERING, pages 774–778. A panel discussion on plant layout for industrial reconversion followed.

PROBLEMS OF INDUSTRIAL EDUCATION

Success with its program on the training of ingenuity encouraged the Committee on Education and Training for the Industries to develop the subject of leadership. As an introduction to this new series, the Committee sponsored a session on education for management at the 1944 Annual Meeting. Harold V. Coes, past-president of the Society, served as chairman at this session and the papers were presented by R. C. Muir, vice-president in charge of engineering and assistant to the

president of the General Electric Company, and Guy R. Cowing, assistant director, General Motors Institute. Mr. Muir's paper, "An Experiment in Management Education," described a course in business management currently given to General Electric employees at the management level. Mr. Cowing's paper, "Upper Management in Training," described the experience of General Motors Institute in acting as a central training agency for General Motors Corporation. Both papers appear in this issue.

On Thursday evening the Committee on Education and Training for the Industries presented three papers on the general subject of the education of returning service men. C. J. Freund, dean of the College of Engineering, University of Detroit, Detroit, Mich., described a pattern for the broadening elements of the curriculum, as developed at the University of Detroit for engineering students. William F. Patterson, director of Apprentice Training Service, War Manpower Commission, spoke on apprentice training after the war, and Mark Ellingson, president, Rochester Institute of Technology, discussed the value of technical-institute training.

HELICOPTERS DISCUSSED BY AVIATION DIVISION

At a popular session on Monday evening the Aviation Division presented three papers and a motion picture showing Sikorsky helicopters in flight. Donnell W. Dutton, director, Daniel Guggenheim School of Aeronautics, Georgia School of Technology, gave a historical résumé of the development of the helicopter. The helicopter of the Bell Aircraft Corporation was described by Bartram Kelley of that corporation. Rotawings helicopters were described in a paper by Joseph S. Pecker, which was presented by his son in his absence.

Other sessions of the Aviation Division were held jointly with the Industrial Instruments and Regulators, the Oil and Gas Power, and the Applied Mechanics Division.

APPLIED MECHANICS DIVISION

The extensive program of the Applied Mechanics Division was supplemented by a dinner on Tuesday evening at which President Gates and President-Elect Bailey spoke briefly. The principal address at the dinner was delivered by W. R. Hawthorne, British Air Commission, Washington, D. C., whose subject was "Engineering Research Behind R.A.F. Victories."

Six technical sessions were sponsored by the Division. The session on Monday evening, with four papers, was devoted to mechanical waves, mechanics of metal cutting, and turbulence diffusion. Elasticity and stress analysis (four papers) were discussed at the second session on Tuesday afternoon, and at the Tuesday evening session there were four papers on plasticity and strength of materials. Vibration (four papers) was the general subject of the Wednesday afternoon session. Friday morning's session, held jointly with the Aviation Division, had a program of four papers on a variety of subjects. The concluding session, on Friday afternoon, dealt with subjects mostly related to aviation.

Most of the papers presented by the Applied Mechanics Division were preprinted for the meeting and will be published in the Transactions or the *Journal of Applied Mechanics* as opportunity is afforded.

PRODUCTION ENGINEERING DIVISION HOLDS JOINT SESSIONS

Most of the papers delivered at sessions sponsored by the Production Engineering Division were on the general subject of metal cutting and are referred to in the account of the activities of the research committees. Jointly with the Metals Engineering Division there was a session on Wednesday afternoon at which two papers were presented: "Trend in the Use of Welded Machinery Parts," by E. J. Charlton, assistant to the president, Lukenweld, Inc., Coatesville, Pa.; and "Indicated Principle for Postwar Machining," by Carl Himmelright, Warner and Swasey Company, Cleveland, Ohio. A fourth session, already referred to, was held jointly with the Materials Handling and Management Divisions.

POWER SESSIONS LARGELY ATTENDED

As usual, the technical sessions of the Power Division drew large attendances. Five sessions were sponsored by the Division, two of which were held jointly with the Fuels Division. The first session, held on Monday evening, was devoted principally to the photographic analysis of furnace conditions. Postwar power problems was the subject of a symposium held at the Tuesday evening session, while there was conducted at the same time a session on furnace performance factors, under the auspices of the Research Committee on Furnace Performance Factors.

The present-day status of dust collection was reviewed in a symposium held Wednesday morning and another symposium on metallurgy in marine engineering conducted Thursday evening with papers on ship plate, ship pipe, mechanical equipment, and electrical equipment.

On Thursday afternoon the Power Division presented a paper on the "10,000-Kw Railway Mounted Mobile Steam Power Plants for the U. S. Navy Department, Bureau of Yards and Docks," by Edwin Lundgren, of the Bureau, and L. R. Biggs, Construction Engineering Division, General Electric Company. A scale model of the mobile power plant was on display during the entire meeting.

WATER HAMMER AND PUMPS

Two sessions of the Hydraulic Division, on Tuesday morning and afternoon, presented papers on water hammer and pumps.

METALS ENGINEERING DIVISION

The Metals Engineering Division held three technical sessions, one jointly with the Production Engineering Division already mentioned.

At the session on Tuesday morning the papers were devoted to nickel and high-nickel alloys and to applications of magnesium. A third paper, by Archibald Black, administrative engineer, Simmonds Accessories, Inc., Long Island City, dealt with "Some Recent Developments in Engineering Materials—Part I, Ferrous Metals," The second part of Mr. Black's paper, covering nonferrous metals, was presented at the Tuesday afternoon session. Other papers at the Tuesday afternoon session covered fabrication costs of boilers, tanks, and pressure vessels, as affected by plate widths, fatigue strength of $5^1/_4$-in-diameter shafts, and relative costs of castings and welded structures in Diesel-engine design.

SESSIONS OF FUELS DIVISION

A luncheon of the Fuels Division, held at the Hotel McAlpin on Tuesday noon followed a session at which two papers were presented: "Ignition Through Fuel Beds on Traveling- or Chain-Grate Stokers," by E. P. Carman and W. T. Reid, of the Fuels Section, U. S. Bureau of Mines, Pittsburgh, Pa.; and "Handling and Burning Fuels on Board American Ships," by David Schoenfeld, assistant manager, marine department, Combustion Engineering Company, Inc., and G. P. Haynes, Todd Shipyards Corporation, New York, N. Y.

After the luncheon the Fuels Division conducted a symposium on future trends of fuels. Experts in the fields of bituminous and anthracite coal, petroleum, natural gas, synthetic liquid fuels, and manufactured gas discussed principally the available supplies of these fuels.

Other sessions of the Fuels Division were held jointly with the Power Division and the Research Committee on Furnace Performance Factors.

INSTRUMENT SESSIONS

Two sessions, one jointly with the Research Committee on Fluid Meters and the other with the Aviation Division, were held by the Industrial Instruments and Regulators Division on

Tuesday. Between these two sessions the Division met for luncheon at the Hotel McAlpin. The sessions are mentioned elsewhere in this report.

WOOD INDUSTRIES

Three papers were presented at the session on Tuesday afternoon sponsored by the Wood Industries Division. Subjects covered in these papers were the preplanning of logging operations for minimum costs, modern uses of coated abrasives, and laminated lumber for extreme service conditions.

The session was preceded by a luncheon at which C. L. Babcock, Babcock Machinery Company, New York, N. Y., gave an illustrated talk on recent developments in woodworking machinery.

A Forest Conservation and Fire Prevention Conference between representatives of the Society of American Foresters and representatives of the A.S.M.E. was conducted on Tuesday afternoon and resulted in the formation of a committee to develop interest in the aid mechanical engineers can give in the design and construction of forest-fire-fighting equipment. Two papers were presented by representatives of the Society of American Foresters. Taking part in the conference were representatives of the A.S.M.E. Standing Committee on Safety, the Industrial Instruments and Regulators Division, the Wood Industries Division, and the Aviation Division.

HEAT TRANSFER SESSIONS

An extensive program of papers in seven sessions was sponsored by the Heat Transfer Division. In four sessions, a symposium on extended-surface heat exchangers, with a total of 12 papers, was conducted. The Thursday evening session took the form of a panel discussion on high speed heating times, techniques, and uniformities, with three contributors.

On Friday morning three papers were presented relating to numerical methods for transient heat flow, effect of ventilation rates on cabin temperatures, and an electrical geometrical analog for heat flow.

The symposium on methods of measurement of heat absorption in furnaces, Friday afternoon, covered applications to boiler furnaces and industrial furnaces.

RAILROAD PROBLEMS

At the first session of the Railroad Division, held jointly with the Oil and Gas Power Division, the two papers on gas-turbine and locomotives, which were published in the November, 1944, issue of MECHANICAL ENGINEERING, were presented and discussed. The A.I.E.E. Land Transportation Committee co-operated in the session.

On Thursday morning the progress report of the Railroad Division, MECHANICAL ENGINEERING for December, 1944, was presented. Three papers on locomotives made up the remainder of the program.

At the third Railroad Division session four papers were presented covering air brakes, shearing stress in skin-stressed box-car sides, freight-car truck development, and passenger-car trucks.

OIL AND GAS POWER

In addition to its session with the Railroad Division on the subject of gas-turbine locomotives, the Oil and Gas Power Division held a second session with the Aviation Division. The subjects discussed were: lubrication ceiling, optimum compression ratios for high-speed Diesel engines, and high-temperature gas-turbine power plants.

SUGAR-PROCESS LUNCHEON AND SESSIONS

A Sugar-Process luncheon was held on Thursday noon following a technical session under the auspices of sugar-industry engineers and the Process Industries Division.

At the technical session two papers were presented, one on the development of salt-water distilling plants and the other on a preliminary Tyndallmetric study of sugar-refinery liquors.

Two papers relating to air conditioning were presented by the Division on Friday morning, one on the heat pump and the other on the Servel all-year gas air-conditioning unit.

PLASTICS AND RUBBER

Three papers on plastics were presented at the first session of the Rubber and Plastics Division: Creep properties of molded phenolic plastics at elevated temperatures, effect of some environmental conditions on the permanence of cellulose-acetate and cellulose-nitrate sheet plastics, and properties and development of Papreg, high-strength laminated paper plastic.

At the afternoon session the annual progress report of the Rubber and Plastics Division was presented. There were also two other papers: Creep and relaxation in rubber products and use and evaluation of some specialty adhesives.

TEXTILE SUBJECTS DISCUSSED

Two papers were presented at the Friday morning session of the Textile Division: The influence of ring size bobbin diameters and spindle speed on the spinning of yarn, and the mechanical properties and uses of wool felt. The session was followed by a luncheon.

COLLEGE REUNIONS

In accordance with the practice of former years, several groups of alumni of universities and engineering colleges held "reunions" in connection with the 1944 Annual Meeting.

On Thursday evening, November 30, the Cornell Society of Engineers held its Second Fall Meeting at the Cornell Club of New York. The same evening The Harvard Engineering Society held its regular meeting at the Harvard Club of New York.

New York University opened its laboratories and offices of the department of mechanical engineering at University Heights, on Thursday, November 30, until 5 p.m. and members of the department were on hand to welcome alumni who were attending the Annual Meeting.

On the evening of November 30, the Purdue Club of New York City held its twenty-fifth anniversary Dean Potter Night meeting; Stevens Institute of Technology held a "Charlie Gunther Night" at the Stevens Metropolitan Club, and Worcester Polytechnic Institute, New York Chapter, held its annual dinner at the Yale Club. Rensselaer Alumni Association, Rensselaer Polytechnic Institute, held a luncheon meeting on November 30 at the Murray Hill Hotel. The Yale Engineering Association held its Fall Smoker at the Yale Club on Friday evening, December 1.

CREDIT FOR SUCCESSFUL MEETINGS TO COMMITTEE

While the thanks of all members and guests are due to the numerous speakers and authors of technical papers, and to the chairmen of sessions at which these persons appeared, all of whom have been included in resolutions passed by the Council and members in attendance, a large portion of the credit for the most successful and largest of all A.S.M.E. Meetings must be given to the many committees on whom fell the burdens and responsibilities of arranging and carrying out the details of the programs.

Outstanding among these committees must be mentioned the Committe on Meetings and Program, on which the major task of preparation and operation falls. The chairman of this committee is L. K. Sillcox, with whom served F. G. Switzer, R. A. North, D. S. Walker, and Paul W. Thompson, with Chas. H. Carman, Jr., Junior advisor to the Committee.

Special committees, made up of members of the A.S.M.E. Metropolitan Section, on whom fell a large proportion of the detail of the meeting, were as follows:

RECEPTION: T. B. Allardice, Theo. Baumeister, W. L. Betts, E. J. Billings, F. P. Brand, H. C. R. Carlson, Chas. Carman, Jr., F. D. Carvin, H. V. Coes, John Constance, E. V. David, G. A. Doremus, A. Ehbrecht, E. H. Fezandie, R. W. Flynn, C. F. Foell, V. M. Frost, C. W. Gabor, R. F. Gagg, R. M. Gates, W. S. Gleeson, E. Douglas Grimson, G. E. Hagemann, Ernest Hartford, C. A. Hescheles, G. G. Hyde, J. J. Jacobs, Jr., H. A. Johnson, H. R. Kessler, J. H. Krooss, J. N. Landis, W. H. Larkin, H. E. Martin, W. B. Moen, J. J. Moro-Lin, A. R. Mumford, K. G. Neal, G. J. Nicastro, A. L. Nicolai, P. T. Onderdonk, C. B. Peck, G. M. Perrin, P. B. Petty, Jr., W. Raisch, J. H. Sengstaken, L. B. Schueler, M. S. Symon, H. Weisberg, and F. L. Yerzley.

DINNER AND HONORS NIGHT: E. W. Legier, chairman: H. R. Kessler, vice-chairman; W. H. Larkin, S. H. Libby, G. J. Nicastro, L. B. Schueler, J. H. Sengstaken, and Mrs. F. M. Gibson, Jr.

PLANT TRIPS: F. P. Brand, chairman; C. B. Arnold, J. D. Constance, E. H. Fezandie, A. L. Nicolai, and W. Raisch.

JUNIOR GROUP ACTIVITIES: Chas. H. Carman, Jr., junior chairman; J. J. Jacobs, Irving Taylor, and Irving West.

USHERS: G. J. Nicastro, chairman.

WOMEN'S EVENTS: Mrs. C. P. Bliss, honorary chairman; Mrs. Earl B. Smith, general chairman; Mrs. Waldo McKee, general vice-chairman; Mrs. A. W. Anderson, registration; Mrs. G. W. Nigh, annual luncheon; Mrs. F. M. Farmer, Monday tea hostesses; Mrs. A. M. Feldman, Mrs. Crosby Field, Mrs. H. R. Kessler, and Mrs. Erik Oberg, activities; Mrs. C. H. Kent, Publicity and Printing, and Mrs. F.M. Gibson, Jr., "AsKme."

Engineers of Tomorrow

(Continued from page 8)

years ago, emphasized that our universities grew out of the needs of life at specific times. That is true also, of course, of every type of educational institution, whether for youth or adults. He added: "The reasons that persuaded men to foster great educational institutions are even more persuasive today. The great advances in science and technology have complicated our lives at the same time that they have effected a vast liberation of human energy and lifted from our backs the physical burdens borne in earlier times. The moment that science spread any single good to the masses it became a social force. Impact followed impact until notice had to be taken by town meeting and congress alike of the clash of forces and the need for their reconciliation through law. Every step in this complicated process has called for men trained in their specialties and also sensible of the general good. Back and forth between these two allied purposes—of progress in the creation of instruments of power and mass application for good and not for evil—the mind attempts to weave a band of intelligence and reason, a progressiveness and a conservatism, a desire to keep and a desire to change, a desire to avoid war and a desire to live peacefully in the midst of a world involved in the risks of creation."

The changes we engineers have fostered—to create this fast-shifting world of new tools, gadgets, methods—to put to use the great forces of steam, electricity, chemistry—have been made against a background of a slower-changing human nature, ill adapted in its fundamental characteristics to such rapid change in its environment. These changes have value only in so far as they improve life for human beings. Our civilization can advance only as the adjustments in human relations keep pace with changes in our environment, or at least do not lag too far behind them. The heritage of freedom Americans enjoy, which has permitted our profession to make its finest achievements and which we depend on for future progress, cannot be taken for granted—else we shall lose it.

While the nature of our civilization and our daily life is being changed by science, engineering, and industry, we must keep open, indeed open wider, the door of individual opportunity—encourage the study of human relations as well as the relations of impersonal forces and materials—adapt our educational facilities and programs to the needs of life tomorrow, as best we can foresee them.

As the horizon widens, as new frontiers open, what engineering students, when engineers, will do in the postwar world seems to involve far greater opportunities, far greater responsibilities than ever before. The content and methods and reach of engineering education will inevitably change accordingly. As engineering education keeps pace with expanding opportunities for engineers and the changing requirements of society, so will our profession continue to serve its day and generation with increasing efficiency and with ever-widening fulfillment of its charter of service.

Postwar Federal Taxes

(Continued from page 32)

lieve that new legislation will be devised to accomplish this purpose. The nature and timing of this revision, however, cannot now be clearly foreseen.

It is obvious that there will be limited opportunity for any major tax reductions in the near future. Though Federal expenditures are expected eventually to drop to a peacetime figure of around $18 billion, this amount will not be attained during the first or even the second postwar fiscal year. During early reconversion, tax receipts even at present high rates will diminish because of declines in incomes of individuals and in earnings of corporations before taxes.

It seems safe to predict that the excess-profits tax will eventually go. This reform was strongly urged by Mr. Byrnes in his recent report to the President, and the Colmer House Report expresses the same view. Some difference of opinion exists, however, as to the rates on ordinary corporate earnings and on personal incomes.

It would seem that a reduction in the normal-plus-surtax rates would affect more companies than a cut in the excess-profits tax, and would especially benefit new concerns and those most hampered by reconversion difficulties. As to the excess-profits tax, it is of particular importance that there be a reasonable assurance of its removal within a year or two after the end of the war. Postwar investments are not likely to result in large profits till some time after such investments are made. Thus there is no great urgency for the immediate abolition of this tax.

But, from present indications, it looks as though the excess-profits tax will in fact be among the first to be cut. It is regarded in a special sense as a war levy. The plans of private groups and the suggestions originating from the Administration and from Congress all concur in regarding this method of taxing business as unsuited to a peacetime economy.

No Snapshots This Year

BECAUSE of the shortage of film, engraver's metal, and volunteer photographers, our usual informal snapshots of groups and of individuals taken during the Annual Meeting week have been omitted this year.

A.S.M.E. NEWS

And Notes on Other Engineering Activities

Local Section Delegates Hold Conference to Discuss A.S.M.E. Policies, Affairs, and Problems

EACH year during the Annual Meeting of The American Society of Mechanical Engineers, the Local Sections Delegates hold their Annual Conference. This group consists of two delegates from each of the eight regional groups of Local Sections. These delegates and their Annual Conference provide a means whereby the ideas, opinions, and criticisms of the members at large are transmitted to the Council of the Society for consideration.

Similar conferences have been held in the past for a period extending well over a quarter of a century. At present each of the eight regional groups have representation by two delegates. Each delegate serves for a period of two years. Elections are so designed that one new delegate from each group comes to the conference each year.

How the Conference Operates

Items on the agenda for discussion by the delegates are compiled by the agenda committee from suggestions sent in during the year by the various local sections, standing committees, professional divisions, and members of the Council.

These items are then submitted to the local sections for approval and comment before being compiled into the final agenda used both by the regional conferences and the National Delegates Conference.

Each delegate brings to the conference instructions and resolutions from the regional conference held in his particular geographical area, which is held in the early fall.

This year's conference was called to order at 9:40 a.m. Sunday, November 26, by Speaker H. C. R. Carlson, and continued in session until Monday, November 27, when it adjourned at 12:40 p.m. R. M. Scott served as secretary. The chairman of the agenda committee was W. W. Babcock.

Delegates Attend the Conference

The following is a list of delegates. The terms "one year" and "two years" indicate whether the delegate was serving for the first or second time.

The opening session was addressed briefly by President Robert M. Gates who stressed the importance of bringing the membership closer together and the need of careful selection of leaders for the local sections as the sections are the "grass roots" of the Society.

Past-President Coes gave a brief progress report of the Special Joint Committee which he appointed to investigate the possibility of uniting all engineers into a strong professional body.

President-Elect Alex D. Bailey was introduced to the delegates.

Among the members of the Local Sections Committee attending the sessions and giving valuable assistance were S. R. Beitler, chairman, J. A. Keeth, chairman-elect, F. L. Wilkinson, Jr., A. R. Mumford, S. D. Moxley, and O. B. Lyman.

Secretary Davies and Executive Assistant Secretary Ernest Hartford, dropped in occasionally. Others who appeared in an advisory capacity were R. L. Sackett and T. S. McEwan.

Delegates at Conference

	Term	Name	Section
Group I	1 year	R. M. Scott	Providence
	2 year	J. R. Hicks	Waterbury
Group II	1 year	H. C. R. Carlson	Metropolitan
	2 year	R. W. Flynn	Metropolitan
	Alt.	A. Ehbrecht	Metropolitan
Group III	1 year	F. W. Miller	Philadelphia
	2 year	J. H. Potter	Baltimore
Group IV	1 year	P. R. Yopp	Atlanta
	2 year	E. E. Williams	Piedmont
Group V	1 year	J. G. Martin	Cincinnati
	2 year	J. J. Uicker	Detroit
Group VI	1 year	W.W. Babcock	Central Ill.
	2 year	H. L. Solberg	Central Indiana
	Alt.	R. T. Mees	Central Ill.
Group VII	1 year	B. T. McMinn	Western Washington
	2 year	R. G. Roshong	So. California
Group VIII	1 year	G. H. Woelbing	Colorado
	2 year	O. L. Lewis	Mid-Continent

Outstanding Actions of the Conference

This year there were twenty items for discussion on the agenda. Of these, three were outstanding. These were:

(1) The question as to the stand the Society should take in regard to collective bargaining.

The delegates were convinced that the Society should keep abreast of developments in this line and take whatever action might be deemed expedient. Also that A.S.M.E. should recommend that legislative action be taken toward placing the professional engineer in the same excluded class as the physician and lawyer in the matter of collective bargaining.

(2) The problem of the Society in carrying out student-guidance work in the high schools.

The delegates were of the opinion, after hearing Mr. Larkin tell of the work being done in the New York area, that this work must be carried on by the local sections, but that the National Society must disseminate information relating to the experience of the several sections already actively carrying on this work in their local high schools.

(3) The problem of Society Organization Structure.

The delegates requested that the Society be so organized that each region would elect it's own vice-president to have the responsibility of regional operations and that directors at large be utilized as heads of technical boards and other national administrative duties. It was felt that in this manner there would be better representation of the individual member than under the present system.

The report and findings of the conference were presented to Council by Speaker H. C. R. Carlson on Friday morning, December 1.

The action taken by last year's group conference in setting up standards for material to be used in the agenda was found to be of great benefit in eliminating unessential items from the agenda.

Brief History of Aviation Division

Dr. John E. Younger gave a brief history of the growth of the Aviation Division. He also outlined the work which he had done in this regard during the past year, which included visits to 21 sections scattered throughout the country. This work alone took Dr. Younger away from home for a period of about

four months. Dr. Younger is to be congratulated on the fine work which he has done with the Aviation Division.

Officers for 1945 Conference

Officers for the 1945 National Conference were checked as follows:

Speaker	J. J. Uicker	Detroit
Vice-Speaker	E. E. Williams	Piedmont, N. C.
Secretary	R. G. Roshong	Southern California
Agenda Chairman	H. L. Solberg	Central Indiana

[The foregoing account was prepared by R. M. Scott, Secretary of the Conference.—EDITOR.]

Sixteenth National Exposition of Power and Mechanical Engineering

FROM every viewpoint the Sixteenth National Exposition of Power and Mechanical Engineering, held in Madison Square Garden, November 27 to December 2, was a huge success. The exposition covered every conceivable kind of industrial activity. The range of exhibits displayed was complete, from stokers, pumps, fans, valves, to insulation, steam specialties, metals, welding, transmission and materials-handling apparatus, precision instruments, power and hand tools, and many other products.

The exhibit of The American Society of Mechanical Engineers at Booth No. 3 was one of the most popular displays at the Show. Prominently located, equipped with books and publications, comfortably furnished, and well staffed, the booth was the meeting place for members of the Society and for visitors seeking knowledge, information, and rest.

This year's exposition was organized with the primary purpose of aiding in the war-production effort, also of assisting in the furtherance of plans for the conversion of industrial plants back to civilian pursuits when the war is over. Throughout the period of the exposition there was a large attendance made up of representatives of the armed forces, business executives, plant managers and superintendents, chemists, metallurgists, chief engineers, designers, research directors; civil, mechanical, electrical, and mining engineers; and many others.

L. F. Lyne, Jr., Metropolitan Representative for License of Enemy Patents

LEWIS F. LYNE, Jr., former member of the A.S.M.E. Metropolitan Section Executive Committee, has been appointed technical representative for the metropolitan area in the government's program to license to American business and industry some 45,000 seized enemy patents controlled by Alien Property Custodian James E. Markham.

Mr. Lyne's first assignment was to furnish A.S.M.E. members at our recent Annual Meeting in New York City condensed data on the seized patents and to invite them to his headquarters at 120 Broadway, New York, to inspect actual patents themselves. Over 350 members stopped at his information desk. He also made short talks before the Rubber and Plastics and Heat Transfer Divisions.

LOUIS F. LYNE, JR.

Mr. Lyne's duties will be to acquaint manufacturers and prospective manufacturers with the opportunities which exist in these patents for war and postwar uses.

Previously Mr. Lyne served in an executive capacity with the Air Service Command at Dayton, Ohio.

A. C. Streamer, President of N.E.M.A.

AT the annual meeting, October 26, in New York City, of the National Electrical Manufacturers Association, A. C. Streamer, member A.S.M.E., vice-president of Westinghouse Electric & Manufacturing Co., was elected president for the coming year.

A.S.M.E. BOOTH AT THE NATIONAL POWER SHOW

Suggestions for 1946 Officers Requested by Nominating Committee

ELECTED at the business meeting of the Society on November 27, the 1945 Nominating Committee in its organization meeting on November 30 chose W. H. Larkin chairman and Ralph A. Sherman secretary. Arrangements were made for a preliminary meeting in April and for the executive meeting, at which nominations will be made, in Chicago during the Semi-Annual Meeting, June 17–21, 1945.

Proposals by Individual Members Welcomed

Proposals from any member for candidates for the offices to be filled will be welcomed by the Committee, and members are urged to submit the names of candidates and their records at an early date. The record should be submitted on the proposal form prepared by the Committee. Before submitting the name of a candidate, his consent to serve should be obtained by the proposer. The proposer, not the candidate, should fill out the form.

Proposal forms may be obtained from any member of the Committee listed below. The completed forms should be sent to the Secretary of the Nominating Committee, Ralph A. Sherman, Battelle Memorial Institute, 505 King Avenue, Columbus 1, Ohio.

Eight Offices to be Filled

The offices for which nominations are to be made are those of President, four Vice-Presidents to serve two years, and three Managers to serve three years. A candidate for President or Vice-President must be a Fellow or Member of the Society. Candidate for Manager may be a Fellow, Member, or Junior Member. Usually, but not necessarily, nominations for the office of President are made from those who are Past Vice-Presidents and for Vice-President from those who have been Managers.

Early Action Requested

The Nominating Committee urges that proposals be sent in early, by April 1, if possible. This will give the Committee more time for full consideration.

1945 National Nominating Committee

Group I

Representative—Fred C. Richardson, Westcott & Mapes, 139 Orange St., New Haven 5, Conn.
1st Alternate —G. A. Orrok, Boston Edison Co., 39 Boylston St., Boston, Mass.

Group II

Representative—W. H. Larkin, *Chairman*, B. F. Sturtevant Co., 420 Lexington Ave., New York, N. Y.
1st Alternate —H. E. Martin, Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y.
2nd Alternate —J. H. Sengstaken, The Western Precipitation Corp., 405 Lexington Ave., New York 17, N. Y.

Group III

Representative—Prof. M. C. Stuart, Lehigh University, Bethlehem, Pa.
1st Alternate —Dr. Henry L. Mason, Taylor Instrument Co., Box 110, Rochester 1, N. Y.
2nd Alternate —Willis H. Carrier, Carrier Corp., 300 S. Geddes St., Syracuse 1, N. Y.

Group IV

Representative—Prof. J. B. Jones, Mech. Engrg., Virginia Poly. Inst., Blackburg 3, Va.
1st Alternate —H. G. Mouat, Whiting Corp., 544 Martin Bldg., Birmingham 3, Ala.
2nd Alternate —P. R. Yopp, The Babcock & Wilcox Co., 1203 Candler Bldg., Atlanta 3, Ga.
3rd Alternate —Prof. J. M. Tucker, University of Tennessee, Estabrook Hall, Knoxville 16, Tenn.

Group V

Representative—Ralph A. Sherman, *Secretary*, Battelle Memorial Inst., 505 King Ave., Columbus 1, Ohio
1st Alternate —W. A. Carter, The Detroit Edison Co., 2000 Second Ave., Detroit 26, Mich.
2nd Alternate —M. R. Bowerman, Alliance Machine Co., Alliance, Ohio

Group VI

Representative—C. F. Moulton, Nebraska Power Co., 4th and Jones St., Omaha 2, Neb.
1st Alternate —W. W. Babcock, Central Illinois Light Co., 316 S. Jefferson St., Peoria, Ill.
2nd Alternate —R. W. Merkle, West Cartridge Co., East Alton, Ill.
3rd Alternate —Prof. H. O. Croft, University of Iowa, 122 Engineering Building, Iowa City, Iowa

Group VII

Representative—Prof. F. W. Candee, State College of Washington, Pullman, Wash.
1st Alternate —E. B. Parker, State College of Washington, Pullman, Wash.
2nd Alternate —N. W. Humphrey, Washington Water Power Co., 825 Trent St., Spokane, Wash.

Group VIII

Representative—Prof. H. E. Degler, University of Texas, Austin 12, Texas
1st Alternate —E. J. Wacker, Jr., Magnolia Pipe Line Co., Box 900, Dallas 1, Texas
2nd Alternate —L. J. Cucullu, New Orleans Public Service, Inc., 317 Barrone St., New Orleans 9, La.

President's Page

The New Year

NEW YEAR'S is in many ways the most optimistic time of the year. Somehow we feel that the old year with its trials, its hardships, and disappointments is a thing of the past, and we face each new year with optimism and hope, confident that it will be better than its predecessor. It is a time when we take stock of our past experiences and look ahead and make new plans and new resolutions for the future.

We have every reason to start this New Year with the greatest optimism. Although we had hoped for victory in the European theater of war last year we feel certain of it in the near future. We confidently hope for a lasting peace, during which everyone's energy and thought will be devoted to things constructive and worth-while. There will be problems of readjustment, it is true, but these are being anticipated and studied, and we are confident that they will be solved as rapidly as they occur.

To your Council, to your Society, and to your profession this New Year is one of unusual promise and importance. We have a background of successful operation; upon this background we can plan the future. Officers and members of standing and special committees have been appointed so that these may carry on their work without interruption. The officers of the sections have returned to their respective areas encouraged and stimulated by their contacts at the Annual Meeting. The officers and committees of the professional divisions likewise have planned and started their activities for the coming year. The rotation of officers and of the personnel of these groups supplies new ideas and new energy. The proposed changes in organization which were recommended at the business meeting, and which will shortly be sent to the membership for approval, will strengthen the section and group organizations by giving them direct representation on Council. Proposed changes in membership classification should attract to us and make it possible for us to accept many worth-while men who had previously been barred.

Our Society is not only carrying on its traditional activities and in addition those occasioned by the war but is giving serious thought to postwar plans and engineering opportunities and is interesting itself in matters of national importance. The next year will be a busy one, but we are sure that as a result of the plans being made, we shall be able to render a greater service to our profession and to our country.

(*Signed*) ALEX D. BAILEY, *President*, A.S.M.E.

United Engineering Trustees, Inc., Report for 1943-1944

Summary of Facts Concerning Finances, Building, Engineering Societies Library, and Engineering Foundation

THE Annual Report of the United Engineering Trustees, Inc., for 1943-1944 was issued on October 26, 1944, by President F. M. Farmer. Mr. Farmer's report in somewhat abridged form follows:

Fortieth Year

With much of the activity in the nation trimmed to a wartime economy in this third year of our country's involvement in the global war, operations of the Board of Trustees have been reduced to those which were absolutely necessary. Our Trustees as individuals have answered the many calls to time- and energy-consuming assignments connected with the national emergency in addition to carrying on their own professional work. Further, as will be noted in the attached reports, the major efforts of our departments have been limited to projects contributing to winning the war.

The Board of Trustees maintained its regular meeting schedule throughout the year, keeping in close touch with its custodian duties and directing consideration to such matters as required immediate attention. Certain by-laws governing financial administration but not affecting the Founder Societies, were altered to meet current conditions and to clarify operations. The principal activity of special interest to the Founder Societies was a report of the Pension Committee, including a contributory plan for the retirement of the Corporation employees. This report was submitted to the Founder Societies, two of which approved the plan and two deferred action. It is desirable that some plan be initiated at an early date in order to include the employees' contributions rather than for the Corporation to carry the entire burden. There is the additional special reason that many of the staff have been with the Corporation for two and three decades and are approaching retirement age.

Engineering Societies Building

When the Engineering Societies Building was dedicated in 1907, the total membership of the four Founder Societies was about 9000. Today the combined membership is close to 70,000. Naturally this growth is making the provision of adequate headquarters space for the Societies an ever-increasing problem. However, what is perhaps more important from the standpoint of building facilities is the great increase within the Societies of the number of specialized activities, each of which has its own organization in the form of a technical division or a committee, so that now the meeting-room requirements are far greater than the building can supply. That the building is not fulfilling the purpose for which it was erected is indicated by the increasing use of hotels with their much greater meeting-room facilities for the annual meetings of the Founder Societies.

Our present building, notwithstanding the limited service it can now render after thirty-eight years of growth of the profession and of the Societies, is in excellent physical condition, being constantly inspected and adequately maintained. Beyond replacement of broken water pipes and new risers in the wiring system of the building, both of which were made necessary by age, only minor repairs have been required during the last year. The meeting halls have been used for military instruction and meetings, and the library has been in daily use by the War Department and by members of the armed forces making special studies.

All available office space is occupied, each occupant sharing in the expenses of operation of the building. All occupants are now strictly engineering organizations, the four Founder Societies occupying about 61 per cent of the space allocated to offices.

Insurance is carried in adequate amount, both fire insurance and extended coverage, so that substantially everything which could happen to the building is provided for. The war-damage insurance which has been carried during the last two years, is automatically extended for an additional year to June 30, 1945, without additional cost. Periodical inspections of the building have been made by fire-insurance and liability-insurance inspectors covering both the state of the building and the housekeeping. The reports state that everything is in excellent condition.

Assembly space in the building has been curtailed to some extent by making several of the most popular meeting halls temporarily available as emergency offices in connection with the war work of one of the Associate Societies. These halls are being returned to their normal use for the coming year.

Financial Matters

Investments. The certificate of Haskins and Sells, certified public accountants, together with balance sheets made by them, verifies the correctness of our accounts and attests the financial transactions authorized by the Board of Trustees. The aggregate book value of the capital fund investments (excluding real estate) at the close of our fiscal year, September 30, 1944, is $1,503,175.93; the market value thereof on or about that date was $1,524,293.64, or approximately 101½ per cent of book value. A year ago the corresponding market value was 102 per cent of the book value.

Operations. The close of the year finds a credit balance for the total operations of the United Engineering Trustees, Inc., of $286.70 which compares with a debit balance of $1,615.24 for the previous year. This favorable showing, despite the rising building-operation costs due to the increase in labor costs allowed by the War Labor Board, and to emergency repairs of the electric-wiring and water systems of the building, is of course principally due to the reduction in the interest payments formerly made to the Founder Societies to token payments of $500 each. Another contributing factor is the increased income from meeting halls.

It is expected that building labor costs will

SUMMARIZED FINANCIAL REPORT, SEPTEMBER 30, 1944

FUNDS AND PROPERTY

Combined Fund:* Summary of Investments, September 30, 1944

		Book value	Market value
FUNDS INCLUDED			
Engineering Foundation Fund		$ 873,137.32	
Edward Dean Adams Fund		88,608.10	
Library Endowment Fund		164,077.42	
Depreciation Fund		513,897.32	
General Reserve Fund		1,500.00	
Total		$1,641,220.16	
Investments: "Legal"	$ 567,616.88		
Nonlegal	1,011,341.58		
Total Investments Sept. 30, 1944	$1,578,958.46		$1,555,259.33
Cash uninvested	15,411.08		
Savings Bank Accounts	46,850.62		
	$1,641,220.16		
Real Estate (Less Depreciation Fund Reserve)		$1,479,896.60	
Henry R. Towne Engineering Fund Investments		44,603.89	32,141.42
Henry R. Towne Engineering Fund Uninvested Cash		231.48	
The D. Guggenheim Medal Board of Award Investments		15,574.01	9,271.31
The D. Guggenheim Medal uninvested cash		265.99	
The John Fritz Medal Board of Award Investment		3,500.00	4,020.45
United Engineering Trustees, Inc., Operating Assets		8,591.08	
Engineering Societies Library Maintenance Assets		38,779.68	
Library Service Bureau Reserve Fund Investments		7,500.00	7,170.00
The Engineering Foundation—unexpended income		41,014.85	
Alloys of Iron Research—unexpended income		3,831.59	
Welding Research—unexpended income		6,363.18	
The Engineering Foundation Custodian Fund Cash		79,724.17	
United Engineering Trustees, Inc., Reserves and Custodian unexpended income		14,412.92	
		$3,385,509.60	

* A group of funds managed as one for convenience and economy in investment transactions.

go still higher, but with the anticipated further increase of meeting-hall rentals and with increased income from space assessments, a reasonable credit balance will again be had a year hence provided of course no abnormally expensive repairs have to be made. Incidentally, it is to be noted that repairs are now charged against current income rather than the building depreciation reserve fund, thus allowing the latter to accumulate against the diminishing value of the Engineering Societies Building at the maximum rate obtainable from the yearly allocation of $20,000 and the income from investments of the fund.

The Engineering Societies Building Vs. The Corporation. The financial statements of the Corporation, the United Engineering Trustees, Inc., are made on a consolidated basis, that is, the costs of operating the Engineering Societies Building and of providing other services to the engineering profession are not shown separately. The impression is too prevalent that for all practical purposes these annual statements apply to the building. An analysis of the 1943-1944 budget expenditures shows that of a total of $105,950 budgeted direct operating expenses for the year ($152,100 less non-operating expenses such as $20,000 to depreciation and renewal fund, $13,000 for telephone service which is rebilled, token interest payments to Founder Societies, etc.), $77,200 or 73 per cent is for operating and maintaining the Engineering Societies Building while $28,750 or 27 per cent is for the operations of the Corporation as such. This estimated cost of the Corporation activities is allocated as follows:

Operations in its custodian capacity for the Founder Societies and as the agency through which certain joint activities of the Founder Societies are carried on in accordance with one of the constitutional objectives of the Corporation (office salaries, office supplies, postage, printing, pensions, etc.).....	$20,750
Accounting services supplied for the Engineering Societies Library (bookkeeping and auditing, insurance, etc.).....	3,970
Accounting services supplied for Engineering Foundation and its committees (bookkeeping and auditing, etc.).....	2,900
Accounting services supplied for John Fritz Medal Board, Guggenheim Medal Board, Engineers' Council for Professional Development, etc.	1,400

Thus of the total assessments paid by the Founder and Associate Societies, roughly 16 per cent goes to the replacement of the Engineering Societies Building (building depreciation reserve fund), 62 per cent to operating Engineering Societies Building, and 22 per cent to operating United Engineering Trustees, Inc., as a corporation acting as the custodian of the joint Founder Society funds and as the agency through which certain joint activities of the Founder Societies are operated. Incidentally, it is to be noted that the 62 per cent paid by the Societies for operating the Engineering Societies Building covers not only the approximately 5½ floors which they occupy, but also the 2½ floors occupied by the Library and the 5 floors taken up by the auditorium, meeting rooms, large first-floor foyer, etc., plus the long-hour service (heat, light, and attendance) required by these 7½ floors.

Engineering Societies Library and the Engineering Foundation

The special reports prepared by the Directors of these departments giving details of their respective operations are included in the pages which follow.

The Future

Building. As has been pointed out in this and numerous preceding annual reports, the present Engineering Societies building has become inadequate to accommodate the office-space requirements of the greatly enlarged memberships of the Founder and Associate Societies, together with the increased meeting facilities incident to the greatly increased number of activities carried on by these Societies. Furthermore, the new and rapidly growing engineering societies of recent years make the problem of an adequate union home for all such organizations a much larger one than it was at the time the building was erected. It is obvious that a decision will soon have to be made with respect to the future, even if only the requirements of the Founder Societies are to be properly met.

In arriving at a decision with respect to the future, such questions as the following will have to be considered:

Should the present Engineering Societies Building be modernized and made adequate for the exclusive occupancy of the Founder Societies, or

Should a new building be erected on a new site to be occupied only by the Founder Societies, or

Should a large building project to constitute an Engineering Center be undertaken on the present site, or some other suitable site, one which would provide headquarters and ample meeting facilities for all engineering societies as well as the Founder Societies, or

Should the latter project be further expanded to include the Engineers' Club and offices for practicing engineers and engineering concerns, that is, revive the plan seriously studied in 1931 by a joint committee of the Trustees and the Engineers' Club?

The problem of reaching a decision on such questions as these and the companion one of providing the necessary funds to carry out any really adequate plan was being studied by a special planning committee when this country entered the war, but activity was then suspended for the time being. It is understood that these matters are about to be taken up again.

Joint Activities. It is reasonable to anticipate that with the return of peace the experience of the war effort will indicate the desirability of more and closer co-operation between engineering societies on matters of common concern. One of the charter purposes of United Engineering Trustees, Inc., is to serve the engineering profession in such a capacity. It is therefore hoped that when a joint activity is proposed, the facilities of United Engineering Trustees, Inc. will be utilized just as far as practicable in the interest of economy of overhead expenses and a minimum of duplication of effort.

Conclusion

In conclusion, it is desired to express appreciation for the assistance of the Trustees during the last year and particularly for their faithful attendance despite the many and unusual war demands on their time. It is also desired to record the appreciation of the Board for the splendid co-operation of the secretaries of the Founder Societies and their staffs.

The Engineering Foundation

Annual Report for the Fiscal Year 1943-1944 to United Engineering Trustees, Inc.

IN THEIR annual report to the United Engineering Trustees, Inc., A. L. J. Queneau, chairman, and E. H. Colpitts, director, The Engineering Foundation, stated:

The Engineering Foundation, established in 1914, completed its thirtieth fiscal year on September 30, 1944.

The accompanying financial statement summarizes the present capital funds of the Foundation, the income and the expenditures during the year. The book value of the capital funds of the Foundation on September 30, 1944, was $962,000.00 compared with $959,000.00 on September 30, 1943. The income for the fiscal year 1943-1944 was $35,472.76 as compared with $35,160.38 for the previous year 1942-1943. For the fiscal year 1943-1944 disbursements amounted to $22,750.78 as compared with $31,790.20 for the year 1942-1943. The balance on September 30, 1944, was $41,014.85 as compared with $28,292.87 on September 30, 1943.

The policy of the Foundation has been continued, that is, to contribute to a number of research projects in diverse fields of engineering and to support financially certain agencies having as their objective the advancement of the profession of engineering. In the selection of projects preference is given to those of a fundamental nature which normally would not be undertaken by industrial research organizations or otherwise, in certain cases where a group of industries are concerned, to furnish merely such support to a project as enables the Foundation to serve, as it were, as a catalyzing agent for the undertaking whose main support is from contributions from industry. In addition projects have been scrutinized with regard to their bearing on the war and have been encouraged only as they promised to contribute to the war effort. Because the Government through its various agencies is able to support any research project of probable importance to the war effort the demand for support from an agency such as the Foundation is limited. Coupled with this is the fact that competent research personnel has been largely withdrawn from educational institutions to serve in Army, Navy, and other Government research and development activities. The result is a continuing lessened demand upon the Foundation's funds for the support of research

projects and a reduction in the number of such projects. It is clear, however, that in the years following the war the need for engineering research in many fields will be even more fully recognized; and in that period beyond any question, the Foundation could profitably employ a much larger income than will be available from its present capital funds.

During the year 1943-1944, work on seven projects has continued and these are covered in the accompanying technical report. For the year 1944–1945 grants were recommended for continuation of work upon five projects and the initiation of three new projects.

The following projects are those in which the A.S.M.E. is particularly interested:

Critical-Pressure Steam Boilers. Project No. 50.

Chairman, Professor H. L. Solberg, Purdue University, Lafayette, Indiana.

The following statement indicates the progress of work on this project.

Corrosion of Alloy Steels by High-Temperature Steam. The original program of tests on unstressed specimens of steel has been completed. Apparatus has been constructed for making a series of stress-rupture tests in a steam atmosphere at 1200 F for exposure periods up to 5000 hours and preliminary tests of 100 hours' duration have been completed on fifteen specimens of the following materials: 18-8, 25-20, 2 Cr and 5 Cr steel. The preliminary tests have shown that the values of stress which were originally selected were too low to produce rupture in the desired time interval. The equipment functioned satisfactorily in the 1000-hour test. New specimens have been prepared and a 5000-hour test is now under way. Contributions on hand or promised are sufficient to complete this program.

A paper on "The Corrosion of Alloys Steels by High-Temperature Steam," by G. A. Hawkins, J. T. Agnew, and H. L. Solberg was presented at the Annual Meeting of The American Society of Mechanical Engineers in November, 1943. This paper presented new data and summarized previously reported data on the corrosion of alloy steels at temperatures from 1000 F to 1800 F together with data on the chemical analysis of the scale formed at 1500 F and 1800 F. The paper was published in the Transactions of the A.S.M.E. in May, 1944.

Temperature Distribution in Tube Walls Subjected to High Rates of Heat Input. Apparatus has been constructed for the purpose of studying the transfer of heat from hot gases flowing past a thick-walled tube to a fluid flowing through the tube in turbulent motion and to enable measuring the temperature field in the tube. Several preliminary tests have been conducted and the results indicate that the major experimental difficulties have been solved.

The acute shortage of staff and the pressure for research on problems of immediate importance to the war effort have made it necessary to suspend work on this project by a regular member of the Purdue University staff, and slow progress is being made by senior students working under supervision.

The Coefficient of Linear Expansion of Alloy Steels. At the suggestion of one of the manufacturers of high-temperature superheaters, an investigation has been initiated to determine the coefficient of linear expansion of alloy steels containing 12 per cent or more of chromium at temperatures up to 2000 F. This work is being financed by Purdue University and is being done by one of the members of the staff as a doctor's thesis. These tests have, however, been discontinued due to the fact that all of the members of the research staff are now engaged in war research. After the war this project will be continued.

Plastic Flow of Metals (formerly Rolling of Steel). Project No. 68.

Chairman, Dr. A. Nadai, Westinghouse Research Laboratories, East Pittsburgh, Pa.

At the eleventh National Meeting of the Applied Mechanics Division of the A.S.M.E. in Chicago a session on plastic flow, sponsored by the Committee, was held June 16, 1944, in which the following papers were presented:

"Drawing Thin-Walled Tubing With a Moving Mandrel Through a Single Stationary Die," by G. Sachs, J. D. Lubahn, and D. P. Tracy.

"Theory of Wire Drawing," by E. A. Davis and S. J. Dokos.

"Influence of Rate of Strain and Temperature on Yield Stresses of Mild Steel," by M. J. Manjoine.

The Special Research Committee for Plastic Flow of Metals of The American Society of Mechanical Engineers has four active research projects, two of which can be reported upon.

Subproject. Investigation on the Friction at Extreme Pressures and at High Temperatures. Work on this investigation started on June 1, 1943, under the supervision of the chairman. S. J. Dokos has been appointed as research engineer for carrying out the experimental investigation. For the fiscal year 1943-1944 $2600 was available from funds of the Engineering Foundation, of which $1600 was contributed by the Engineering Foundation and $1000 was contributed by five companies of the oil industry. Plans for this investigation were originally formulated by the late Prof. George B. Karelitz, chairman, Lubrication Committee of The American Society of Mechanical Engineers. After the death of Professor Karelitz, Dr. Raymond Haskell, of the technical and research division of Texas Oil Company in New York, very kindly offered his active support of this investigation with the result that the afore-mentioned $1000 was subscribed by five companies of the oil industry.

The main objective of this investigation is to observe by experiments the values of the friction coefficient under extremely high pressures at normal and at elevated temperatures between solid metals. Friction should be observed between metallic surfaces in dry conditions and in the presence of extreme pressure with lubricant or lubricants used in forging operations at high temperatures. A machine has been designed and brought in operation at the Westinghouse Research Laboratories using a rotating disk on which a contact cylinder rests under a known load. The disk can be rotated at given speeds and is surrounded with an electrical-resistance furnace in which the temperature can be raised to any desired amount. Friction forces are observed by means of a specially designed spring in the shape of a complete ring and are recorded on waxed paper. It is also contemplated, if necessary, to use a cathode-ray oscillograph for recording rapid fluctuations of the friction force. The experimental apparatus and all facilities to run these tests have been contributed from funds made available by the Westinghouse Research Laboratories, Pittsburgh.

On April 14 a preliminary report entitled "Investigation on Friction Under Extreme Pressures and at High Temperatures" was submitted by S. J. Dokos to the members of the Committee in which the machine and a few observations were described.

At the suggestion of the chairman, Messrs. E. A. Davis and S. J. Dokos developed a theory of the wire-drawing process in which they investigated mathematically the conditions encountered in wire drawing. The plan also was, and is, to measure the forces experimentally under the conditions of drawing of a wire and to compare friction values obtained in this manner with those directly observed on the rotating-disk apparatus. This investigation was presented in a paper at the Summer Meeting of the Applied Mechanics Division of The American Society of Mechanical Engineers in Chicago on June 16, 1944.

At present Mr. Dokos observes the friction values at room temperature using a series of extreme-pressure lubricants which were received from various sources and oil companies. After this comparison is completed, tests at high temperatures will be taken up.

Plans for work over the next year and its support are being formulated.

Subproject. Investigation on Stress-Strain Relations in Various Drawing Processes, by Dr. G. Sachs, Case School of Applied Science, Cleveland, Ohio.

For the year 1943-1944 funds were granted by the Engineering Foundation to support this investigation. During the first six months of the fiscal year the theoretical phase of tube drawing was investigated for cold- and hot-drawing of a thin-walled tube over a mandrel. Messrs. G. Sachs, J. D. Lubahn, and D. P. Tracy, all of Case School of Applied Science, presented a paper entitled "Drawing Thin-Walled Tubing With a Moving Mandrel Through a Single Stationary Die" at the National Meeting of the Applied Mechanics Division of the A.S.M.E. in Chicago, June 16, 1944, in which a theory was developed for the drawing process in a thin-walled tube. Since then the analysis has been partially extended to roller dies and to thick-walled tubes. Dr. Sachs intends to investigate similar drawing conditions by experiments carried out on a drawbench. He intends also to extend this work to other cases of drawing of thin-walled tubes. Plans for continuing this project over the coming year are being arranged, to include roller dies, tandem drawing, and thick-walled tubing.

Unsteady-Heat-Flow Investigations by Electrical Analogy. Project No. 80.

Chairman, Carl F. Kayan, Columbia University, New York, N. Y.

Subcommittee on Heated and Cooled Enclosures, Heat Transfer Division. While a substantial amount of the work covered by the following statement was not supported by the Foundation grants it bears to it such a relationship as to warrant its inclusion. It will be particularly noted that constant effort is being made to make the heat analyzer a more accurate and useful research tool.

The project at the University is conducted by Dr. Victor Paschkis. This work, in part as indicated supported by the Foundation, has

been carried on at Columbia University in the Heat and Mass Flow Analyzer Laboratory, the general project is the dealing with the flow of heat under unsteady (transient) conditions. The analyzer widely used in these studies operates on the basis of an electrical analogy to simulate heat flow as a function of time, with electrical resistance and capacitance replacing thermal resistance and heat-storage effects.

Not only has the laboratory carried on work for the furtherance of the war effort, under government OSRD contracts, but it has likewise been quite active studying unique heat-flow problems for industry. One of these has involved the performance of steel-mill generators; another has been on the thermal problems encountered in the braking equipment of a high-speed railroad train; still another has been concerned with the behavior of a fired furnace under cyclic conditions with respect to temperatures in the wall structure; another has dealt with the freezing of steel ingots; still another has been concerned with thermal conditions in the projection of moving-picture film; and also to be mentioned is the rolling of glass plate from the liquid state.

During this time, likewise, fundamental scientific research on methods has been carried on. One particular problem was investigated at the suggestion of the Subcommittee on Heated and Cooled Enclosures, and concerned itself with the accuracy of the electrical analyzer in its applications to heat-flow problems, and particularly with the effect on its accuracy of the variation in the number of electrical "lumps" or sections in an unsteady-state one-dimensional heat-flow path, or in other words to answer the question as to the limitations of a "lumping" type of analogy. This problem was completed and the results were presented in a paper before the American Institute of Electrical Engineers in January of this year. Another paper giving the results of investigations on the heating-up time of furnaces was presented at the Semi-Annual Meeting of The American Society of Mechanical Engineers in Pittsburgh by Dr. Victor Paschkis, under the auspices of the Heat Transfer Division.

The original equipment of the laboratory, established through a grant from the Research Corporation, had rather limited scope, primarily to one-dimensional problems. Within the last two years, to permit two- and three-dimensional studies to be made with greater facility, the range of the analyzer has been greatly extended through a further grant from the Research Corporation. One hundred additional resistance sections have been installed, bringing the total up to 115, and these extended facilities have already seen much active service in dealing with a variety of complex problems. Furthermore, to insure freedom from weather conditions of humidity and heat, the laboratory has been air-conditioned.

Engineers' Council for Professional Development

Project No. 56 Various Committees.

Chairman, Everett S. Lee, *Secretary*, S. L. Tyler.

1 *Description and Participating Bodies.* The Engineers' Council for Professional Development, hereinafter referred to as E.C.P.D., provides an organized effort to enhance the professional status of the engineers through the co-operative support of those national organizations directly representing the professional, technical, educational, and legislative phases of an engineer's life. The participating bodies are the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Institute of Chemical Engineers, The Society for the Promotion of Engineering Education, the National Council of State Boards of Engineering Examiners, and, since October 24, 1940, The Engineering Institute of Canada.

2 *Objectives.* As just stated the general objective of E.C.P.D. is the enhancement of the professional status of the engineer. To this end it aims to co-ordinate and promote efforts and aspirations directed toward higher professional standards of education and practice, greater solidarity of the profession, and greater effectiveness in dealing with technical, social, and economic problems.

The activities of E.C.P.D. have in large part been carried on through the seven committees indicated in the following summary report.

Committee on Student Selection and Guidance. Chairman, Dr. A. R. Cullimore.

This committee has been very active and has concerned itself with the further development and continuing progress of two important projects:

1 The advisement, counseling, and guidance of students about to enter college, and

2 The development of a battery of tests to aid in the proper selection of students for engineering.

As to advisement, counseling, and guidance, in addition to continuing contacts with prospective engineering students individually and in groups and to distributing printed material of the Council, particular thought is being given to the matter of returning Army personnel and their advisement. A strong and broadly representative subcommittee has been appointed charged with this important phase of the Committee's activity.

As to project (2), measurements to aid in the selection of engineering students, this is jointly sponsored by E.C.P.D. and The Society for the Promotion of Engineering Education. The project is organized in so far as policy is concerned under an Advisory Committee, with a Committee of Consultants appointed by the Advisory Committee and a Measurement Committee nominated by the deans or presidents of the various schools co-operating in the study. This project is under the direction of the Carnegie Foundation for the Advancement of Teaching with Dr. K. W. Vaughn as director of the project.

Committee on Engineering Schools. Chairman, D. B. Prentice.

This committee has continued the accrediting program with respect to collegiate engineering schools. During the fiscal year nine curricula at five institutions were investigated and special consideration was given to eight curricula at other institutions.

During the year, as a new venture, plans were formulated and recommendations made to include the accrediting of technical-institute programs. As this project to date, with one possible exception, has been approved by the Boards of Direction of the participating bodies it is planned to proceed with the accrediting of technical institutes.

Committee on Professional Training. Chairman, John C. Arnell.

The committee has carried forward two projects which it believes will be particularly helpful to the younger engineer in his professional training. These involve revision of the Reading List for Junior Engineers and the preparation of a Manual for Junior Engineers.

Committee on Professional Recognition. Chairman, Prof. C. F. Scott.

This committee has continued its joint activity with the Society for the Promotion of Engineering Education, its aim being to bring a proper concept of the responsibility of the teacher to the student in the matter of the student's professional engineering career.

Committee on Principles of Engineering Ethics. Chairman, Prof. D. C. Jackson.

The chairman of the committee reports that discussion of this project with the various interested bodies has continued, but that no final decisions have been formulated.

Committee on Employment Conditions for Engineers. Chairman, Van Tuyl Boughton.

This committee has continued its studies and has submitted a report to E.C.P.D. outlining the situation confronting the engineering profession.

Committee on Information. Chairman, S. L. Tyler.

The general activities of this committee have been continued.

Office of Scientific Personnel

Project No. 83. National Academy of Sciences, Washington, D. C.

The office of Scientific Personnel established May, 1941, operates under the auspices of the National Academy of Sciences and the National Research Council. At first it was supported by funds under a contract with the Office of Research and Development but over the last year it has been supported by funds supplied by the National Academy itself, by several scientific societies, and by the Engineering Foundation.

The primary function of this office was to assist in finding men competent in critical fields for employment by war agencies, first attention being given to the activities under the Office of Research and Development. It was also possible to assist many departments of the armed services in their search for technical and scientific personnel. While these activities have to some extent continued, the emphasis changed from the securing and locating of personnel to steps looking toward conserving such personnel, under the working of Selective Service, in positions of maximum effectiveness in the war effort. This office co-operated with those responsible for the operation of the Selective-Service System to secure

retention of technical and scientific personnel for the tasks where they can contribute most effectively.

The office has continued many other activities. Among these are its close contacts with the armed services through which among other matters both the Army and the Navy have been assisted in their general training programs.

The office is beginning a consideration of the problems involved in the postwar relocation of scientific warworkers, but it is too early to report upon what steps seem necessary or upon what part this office may be called upon to play during the reconversion period.

Engineering Societies Library

AT a meeting of the Library Board on October 19, 1944, it was ordered that the accompanying statistical table, exhibiting the work of the Engineering Societies Library during the last fiscal year, be presented as the annual report of the Library Board. Owing to illness, the Director was unable to prepare an extended report for presentation, as heretofor.

The statistics show that the work of the library has grown during the year especially as regards the use by nonvisitors which now is forty per cent of the total use. The demands for photostats have been much greater than ever before.

Owing to the war, which has cut us off from European sources, less books were added than in other recent years.

Expenditures were kept well within the budgeted amounts.

SUMMARY OF FINANCIAL RESOURCES

Capital Funds

Endowment, total book value September 30, 1944	$962,000.00
E. H. McHenry bequest in hands of executors during life of two beneficiaries, appraised at probate of will in 1931, approximately	400,000.00

The capital funds are held and administered by United Engineering Trustees, Inc. The net income from endowment was $34,902.75 for the fiscal year ended September 30, 1944. The Foundation Board has discretion in use of income. For many of the enterprises which the Foundation has aided, large contributions of money, services, and materials have been obtained from others. Money "Contributions" from organizations and individuals, for specific activities, passed through the Foundation's accounts from its organization to September 30, 1944, totaled $723,789.34

Expendable Resources—Summary

Balance October 1, 1943		$ 28,292.87
Receipts		
Income from endowment	$34,902.75	
Income from minor items and refund	570.01	35,472.76
Total Resources		$ 63,765.63

Disbursements—Summary

Research Projects	$18,630.25	
Promotion of research and administrative expense	4,120.53	
Total for furtherance and support of research		22,750.78
Balance September 30, 1944		$ 41,014.85

TABLES OF STATISTICS

October 1, 1943, September 30, 1944

	1941-1942	1942-1943	1943-1944
Visitors	23,734	22,260	21,992
Other users	10,648	13,579	15,147
Total	34,382	35,839	37,139
Photostat orders	3,046	3,487	4,029
Photostat prints made	31,254	38,702	53,518
Telephone inquiries	6,097	6,689	6,700
Borrowers	650	1,055	1,133
Books lent	846	1,393	1,533
Searches and copies	103	86	114
Translations	35	30	53
Total acquisitions	10,163	10,286	8,104
Books reviewed	498	420	364
Volumes in Library	154,873	156,780	158,521
Maps	7,859	7,872	8,392
Searches	4,525	4,565	4,654
Total	167,257	169,217	171,567

A.I.M.E. Officers for 1945

HARVEY SEELEY MUDD, of Los Angeles, president and managing director of The Cyprus Mines Corporation, operating on the Island of Cyprus, has been elected president of the American Institute of Mining and Metallurgical Engineers for 1945.

Two vice-presidents elected were: Donald H. McLaughlin, vice-president and general manager, Cerro de Pasco Copper Corporation, New York, N. Y.; and Leo F. Reinartz, manager of the Middletown Division, American Rolling Mill Co., Middletown, Ohio.

Six directors also elected were: C. H. Benedict, metallurgical manager, Calumet & Hecla Consolidated Copper Co., Lake Linden, Mich.; Robert H. Morris, general manager, The Gauley Mountain Coal Co., Ansted, W. Va.; J. C. Nicholls, assistant to the president, The International Nickel Co. of Canada, Toronto; Clyde E. Weed, vice-president in charge of mining operations, Anaconda Copper Mining Co., New York, N. Y.; Eugene A. White, manager, Tacoma Smelter, American Smelting and Refining Co., Tacoma, Wash.; and William Embry Wrather, Director, U. S. Geological Survey, Washington, D. C.

I.R.E. Elects Officers

DR. WILLIAM L. EVERITT, of Washington, has been elected president of The Institute of Radio Engineers to succeed Prof. Hubert M. Turner. Dr. Everitt was recently appointed professor and head of the department of electrical engineering at the University of Illinois and was granted leave of absence to continue his duties as Chief of the Operational Research Branch, Office of the Chief Signal Officer of the United States Army.

As vice-president the Institute has elected Dr. Hendrik J. Van der Bijl of Johannesburg, Union of South Africa.

Three directors elected were: Stuart L. Bailey, Keith Henney, and Benjamin E. Shackelford.

Cornell to Adopt Five-Year Curricula

CORNELL University has announced that it will require five years instead of the conventional four for a bachelor's degree in all branches of engineering after the war.

For a bachelor's degree under the five-year curricula, 180 credit hours will be required, of which not less than 125 will be given to scientific and technical courses and not less than 36 to managerial and nontechnical courses. The nontechnical subjects will be arranged in sequential order throughout the five years, running parallel with the technical studies.

New Home of A.S.T.E.

THE American Society of Tool Engineers established its national office in the Penobscot Building, Detroit 26, Mich. The offices will also house the editorial staff of the *Tool Engineer*, official journal of the society, which the society beginning with the February, 1945, issue will publish itself.

Provisions will also be made in the headquarters for the editorial staff which will prepare the "Tool Engineers' Handbook."

American-Canadian Industrial Mission to London

Reports Steps to Solve Engineering Problems That Have Already Added $100,000,000 to War-Production Costs

WILLIAM L. BATT (Past-President, A.S.M.E.), vice-chairman for International Supply of the W.P.B. disclosed recently that differing standards in the United States and Britain have already added at least $100,000,000 to the cost of the war and have caused incalculable production and repair delays. This statement was made on November 16 at a meeting in the engineering auditorium held under the joint auspices of The American Society of Mechanical Engineers, the American Standards Association, and the Society of Automotive Engineers to report to American industry on the steps being taken to unify British and American practice with regard to manufacture of the threaded parts that keep our war equipment rolling toward Berlin and Tokyo. These include component parts of jeeps, tanks, trucks, gun carriages, gun parts, all kinds of instruments, and thousands of other items of essential war equipment. The technical problems involved include British-American differences in screw threads, pipe threads, buttress threads, studs, and instrument screw threads.

Difficulties created by the difference in Anglo-American-Canadian screw-thread practice led the Combined Production and Resources Board to invite a mission of experts from Britain to this country in 1942 and to a return visit of a Canadian-American mission that reported today to high-ranking American industrialists.

"While the matter of screw threads may seem like a rather simple and workaday matter to the average man," Mr. Batt said, "the fact is that our whole machine-age economy is actually held together by screw threads.

"Before the war, of course, it was a mild sort of joke to tell about the man with the $20,000 Rolls Royce marooned for two weeks in Dubuque waiting for a ten-cent machine screw that, except for the fit of the screw threads, he might obtain in the nearest hardware store.

"Do you realize," he continued, "That in many cases British and American gun parts—or parts for other items—are not interchangeable even though the completed products themselves are of identical design?"

"Can you picture the vast stocks of duplicating replacement parts we have been forced to maintain in the far-flung war theaters simply because our screw threads were different?"

Describing some of the production difficulties encountered in manufacturing war goods for Britain in the United States, Mr. Batt said he had been informed by ordnance engineers that it required three times as long to get British-type tools and gages as it does to get American, and that the price has run three times as high.

The dissimilarity has a long history stemming from the heterogeneous designs which were developed during the early nineteenth century, when the great era of mechanical achievement was beginning in England and America. In World War I some efforts were made to remedy the situation but were dropped at the end of the war. At the end of his address on National Policy, Mr. Batt stated that within the last few days he had discussed the unification of screw-thread standards with high-ranking government officials, to whom he directed this question: "Does the U. S. Government consider the unification of British and U. S. screw-thread standards vital to its future military preparedness and peacetime economic prosperity?"

Spokesmen for the Army, Navy, Aeronautical Board, Maritime Commission, as well as the State and Commerce Departments, were unanimous in their opinion that the unification of screw-thread standards of the three countries should be vigorously pursued, Mr. Batt said, appealing to American industry to further the work in every way that it could.

The Joint United States-Canadian Mission which visited London in August and September was composed of eight members. The U. S. representatives included, Elmer J. Bryant, Greenfield Tap and Die Corporation, chairman of the Mission; Cyril Ainsworth, of the American Standards Association; Paul J. Desjardins, Pratt and Whitney; H. W. Bearce, National Bureau of Standards; Col. H. B. Hambleton, War Department, and Frank E. Richardson, of the Aeronautical Board.

The Canadian members of the Mission were James G. Morrow, vice-chairman of the Mission and chairman of the Canadian Standards Association, and Neil Petersen, president of the Canadian Acme Screw and Gear Company.

Arrangements for the London conferences were made by the Ministry of Production and the British Standards Institution. Stanley J. Harley, Controller of Jigs, Tools, and Gages, acted as chairman of the British Delegation, and Percy Good, director of the British Standards Institution, was vice-chairman. British industry was well represented at all the conferences.

E.C.P.D. to Accredit Technical-Institute Programs

PLANS are under way for the accrediting of the curricula of technical institutes by the Engineers' Council for Professional Development, according to an announcement made on November 27 by H. P. Hammond, dean, School of Engineering, The Pennsylvania State College, who is chairman of a Subcommittee on Technical Institute Programs of E.C.P.D.

"The general purpose of the accrediting program," Dean Hammond said, is to raise the standards of instruction in the field of technical education intermediate between the engineering college on the one hand and secondary and vocational schools on the other, and to place this field of education on a basis of strength and usefulness comparable to the position it holds in other industrial nations. It is expected by this means to enhance the general status of technical and engineering education as a whole."

Personnel of Committee

Dean Hammond announced the personnel of the committee as follows: C. W. Beese of Purdue University; George W. Case of the U. S. Office of Education; John T. Faig of the Ohio Mechanics Institute; L. J. Fletcher of the Caterpillar Tractor Company; E. H. Rietzke, National Council of Technical Schools; and B. M. Woods, University of California.

The Engineers' Council for Professional Development, organized in 1932, is made up of three representatives of each of the following organizations: the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, The American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the American Institute of Chemical Engineers, The Society for the Promotion of Engineering Education, the National Council of State Boards of Engineering Examiners, and The Engineering Institute of Canada.

The work of the Council is carried on by four major committees on student selection and guidance, engineering schools, professional training, and professional recognition which cover all phases of the engineer's career from the time he makes up his mind to enter an engineering college until he has acquired full recognition in the practice of his profession.

Accreditation of curricula of engineering schools was undertaken by the Council many years ago and has resulted in the publication of lists of accredited curricula which are available for public reference. As only curricula leading to degrees in engineering were accredited by E.C.P.D., and as the benefits of accreditation have been so marked, E.C.P.D. was asked to undertake a similar program for curricula of schools of the technical-institute type. Authorization of E.C.P.D. to embark on such a program was recently voted by the eight organizations which comprise the Council. The Subcommittee on Technical-Institute Programs was therefore organized to undertake the development of the accrediting program.

Accrediting Technical-Institute Curricula

At the organization meeting of the subcommittee held in Chicago, Ill., October 22, 1944, a statement of the basis for accrediting technical-institute curricula was adopted. This statement lists the general requirements which accredited curricula must satisfy, such as the length of curricula, requirements for admission, number of the teaching staff, the type, financial stability, and achievement of the institution in which the curricula are offered, and the adequacy of physical facilities.

Principles and procedures to be followed by the subcommittee in its work are the following:

1 Individual curricula are accredited.

2 Rigid standards as a basis for accrediting are avoided in order to prevent imposed uniformity and to encourage educational experimentation.

3 Curricula are appraised on invitation of the institution offering them.

4 Curricula are accredited on the basis of both qualitative and quantitative criteria which are evaluated through visits of inspection by a committee or committees representing E.C.P.D. and through data secured from catalogues, other publications, and questionnaires.

The subcommittee's statement makes it clear that any lists it publishes will include only curricula that have been accredited. It is planned that accrediting may be extended for a period of unlimited duration or may be made on a provisional basis for a limited period with reappraisal at the end of that period. This procedure is the same as that which has been satisfactorily followed by the E.C.P.D. in the accrediting of engineering curricula.

In addition to the accrediting program but only upon request of recognized officials of an institution, informal advice will be given on matters such as changes in educational policy, organization, curricula, personnel, and physical facilities.

It is further planned to reinspect curricula at intervals of three to five years in order to maintain the accredited list on a dependable and up-to-date basis.

Twenty-First Annual Meeting of Woman's Auxiliary to the A.S.M.E.

Mrs. Rudolph F. Gagg Re-Elected President for 1945

THE Woman's Auxiliary to the A.S.M.E. held its Twenty-First Annual Meeting at Hotel Pennsylvania from Nov. 27 to Dec. 1, 1944. Under the able chairmanship of Mrs. Earl B. Smith a varied program was presented for the enjoyment of the large audience. Mrs. Smith was assisted by Mrs. C. P. Bliss, honorary chairman, Mrs. Waldo McKee, general vice-chairman, and the following chairmen of committees: Mrs. A. W. Anderson, Registration; Mrs. G. W. Nigh, Annual Luncheon; Mrs. F. M. Farmer, Annual Tea; Mrs. C. H. Kent, Publicity and Printing; Mrs. F. M. Gibson, "AsKme;" and Mrs. A. M. Feldman, Mrs. Crosby Field, Mrs. H. R. Kessler and Mrs. Erik Oberg, Activities.

Annual Tea

The first morning was devoted to registration and reunion. At noon a group of hostesses accompanied guests to various interesting restaurants. Later in the day, the Annual Tea was held at the Hotel Pennsylvania. Mrs. Farmer was assisted by a large committee at this pleasant and popular event, which was enjoyed by many of the men as well as the women.

Business Meeting

Tuesday morning the annual business meeting convened with Mrs. Rudolph F. Gagg presiding. Mr. McBride, the spokesman for the Metropolitan Section, presented Mr. Alex D. Bailey, president-elect of the A.S.M.E., who greeted the Auxiliary. Mrs. Charles Gus, the treasurer, reported a balance in the General Fund, as of Sept. 30, 1944, of $307.49; Student Loan Fund, $6009.84; and Calvin W. Rice Scholarship Fund, $761.63.

Mrs. J. Noble Landis reported interestingly on the Calvin Rice Scholarship. The recipient this year, who is now at M.I.T. doing advanced work in sanitary engineering, is Luis A. Perez, the first Ecuadorean to receive the the award.

Enthusiastic reports were given by sections chairmen; the Philadelphia, Cleveland, and New York sections chairmen were present in person, and the Los Angeles section was represented by its sponsor.

Officers for 1945

The following officers were elected for 1945: President, Mrs. Rudolph F. Gagg; first vice-president, Mrs. J. Noble Landis; second vice-president, Mrs. Waldo McKee; third vice-president, Mrs. Matthew S. Cumner; fourth vice-president, Mrs. J. A. Fransema; fifth vice-president, Mrs. Eugene R. McCarthy; recording secretary, Mrs. Randall B. Purdy; corresponding secretary, Mrs. L. W. Bennett; treasurer, Mrs. Charles E. Gus.

Annual Luncheon at Engineering Woman's Club

Immediately following the business meeting the members adjourned to the Engineering Woman's Club for the Annual Luncheon. This, as usual, was a delightful occasion and well attended. The Committee presented a charming Style Show, modeled by Auxiliary members and their guests under the direction of Miss Charlotte Wilkinson, style consultant for R. H. Macy & Co., who spoke on "Victory Fashions."

On Wednesday morning a choice of two events was offered: a conducted visit to the American Wing of the Metropolitan Museum, followed by luncheon at the Museum, or a talk by Mrs. Irena Schiller of Helena Rubenstein and luncheon in the Sert Room of the Waldorf-Astoria.

In the evening the women joined the men at the Annual Dinner and Honors Night with the gayety of its reception and dance.

The program for Thursday was held in the Phi Gamma Delta Club, beginning with a most interesting exhibit of motion-picture technique, accompanied by an explanatory talk by Miss Stone of the M.G.M. Company. Luncheon at the Club followed and the afternoon was devoted to a card party.

Rewarding Results for Careful Planning

To the many women who planned months ago for this program for the Annual Meeting results were most rewarding; in the greeting of old friends and the welcoming of new ones, and in the spirit of enthusiasm and co-operation present, the Auxiliary is proud of its aims and accomplishments.

MRS. C. H. KENT
Publicity chairman, Metropolitan Section

Houston Elected President of Rensselaer

LIVINGSTON W. HOUSTON has been elected president of Rensselaer Polytechnic Institute, Troy, N. Y., the country's oldest college of engineering and science, to succeed Dr. William Otis Hotchkiss who retired a year ago last October.

Feeling that this was particularly a time demanding ablest leadership, the committee selected Mr. Houston because of his broad comprehension of the problems and opportunities that face an educational institution such as Rensselaer in the years immediately ahead, and because of his able handling of

L. W. HOUSTON

duties connected with the administration of R.P.I. for more than 10 years.

Mr. Houston, a native of Wyoming, Ohio, and later a resident of Evanston, Ill., was graduated at R.P.I. as a mechanical engineer in 1913, and is a member of The American Society of Mechanical Engineers, and the Army Ordnance Association. He was a captain in World War I and a sergeant major on the Mexican border in 1916. He has been a trustee of R.P.I. since 1926 and associated with its active administration for the last 13 years, as secretary of the board in 1931, and as secretary and treasurer since 1935. As executive vice-president and acting president for most of the war period, he has directed the many war-research and war-training activities that have been under way on the campus.

A.S.M.E. Calendar

of Coming Meetings

April 16–18, 1945
A.S.M.E. Spring Meeting
Boston, Mass.

May 18–19, 1945
A.S.M.E. Applied Mechanics Division Meeting
Buffalo, N. Y.

June 17–21, 1945
A.S.M.E. Semi-Annual Meeting
Chicago, Ill.

October 1–3, 1945
A.S.M.E. Fall meeting
Cincinnati, Ohio

November 26–30
A.S.M.E. Annual Meeting

A.S.R.E. Officers for 1945

J. F. STONE, manager of refrigeration division, Johns-Manville Corporation, New York, N. Y., has been elected president of The American Society of Refrigerating Engineers for 1945.

Two vice-presidents were elected: Charles S. Leopold, consulting engineer, Philadelphia, Pa., and Roland H. Money, chief refrigeration engineer, The Crosley Corporation, Cincinnati, Ohio. John G. Bergdoll, Jr., chief engineer, York Corporation, York, Pa., was elected treasurer. Five directors were elected to serve for three years, as follows: B. H. Jennings, professor of mechanical engineering, Northwestern University, Evanston, Ill.; Charles S. Neeson, chief engineer of the cooling division, Airtemp Division, Chrysler Corporation, Dayton, Ohio; John S. Forbes, president, Superior Valve and Fittings Company, Pittsburgh, Pa.; Warren W. Farr, president and treasurer, Refrigeration Maintenance Corporation, Cleveland, Ohio; and C. Hill Garrison, C. H. Garrison Company, Kansas City, Mo.

Foreign Welding Terms

A GLOSSARY of foreign welding terms (German, French, Russian, Spanish) published by the American Welding Society is now available to supplement standard or engineering dictionaries. Many of the terms for which English definitions or equivalents are given have been derived from foreign technical literature and are not found in any standard or technical dictionaries. The glossary, which is published as a paper-covered pamphlet of 16 pages, may be purchased from the American Welding Society, 33 West 39th Street, New York 18, N. Y.

I.E.S. Research Fund Officers for 1945

P. H. DAGGETT, Dean of the College of Engineering, Rutgers University, New Brunswick, N. J., has been elected chairman of the Board of Trustees of the Illuminating Engineering Society Research Fund for 1945. Other officers elected were A. H. Nicoll, president of the Graybar Electric Company, New York, N. Y., treasurer; and A. Dexter Hinckley, secretary.

1944 Guggenheim Medal to Lawrence D. Bell

THE Daniel Guggenheim medal for achievement in aeronautics has been awarded to Lawrence D. Bell for "achievement in design and construction of military aircraft and for outstanding contributions to the methods of production."

Mr. Bell is one of the few aeronautical pioneers still actively engaged in the industry. He is widely known for his *Airacuda*, *Airacobra*, and *Kingcobra* fighter planes, which have held such an important place in the united nations' air leadership in the present war. He is less well known to the public as an important producer of the Boeing B-29 Superfortress. Bell is responsible also for the design and production of special ordnance devices. The breadth of his interests includes rocket planes and helicopters.

Bell's intense interest in aviation took him, at the age of seventeen, into the Glenn L. Martin Company where a year later he was shop foreman, quickly rising to vice-president and general manager. After sixteen years in that connection, he became vice-president and general manager for the Consolidated Aircraft Corporation. Seven years later he organized his own company, specializing in fighter planes. He served as president also of the East Coast and of the National Aircraft War Production Councils and achieved recognition in business through his place on boards of directors in various companies.

The Daniel Guggenheim Medal was established in 1928 to "be awarded to a person in recognition of some notable achievement performed by him which shall tend to the advancement of aeronautics." The award is made by a committee appointed by The American Society of Mechanical Engineers, Society of Automotive Engineers, and The Institute of the Aeronautical Sciences together with past medalists residing in the United States which have included Orville Wright, Boeing, Douglas, Martin, and Doolittle.

Western Society of Engineers Celebrates 75th Anniversary

THE Western Society of Engineers will celebrate the 75th anniversary of its founding on Dec. 5, 1944, in the grand ballroom of the Sherman Hotel, Chicago, Ill.

The society was founded in 1869 and its early organization thus places it as the third oldest engineering society in the United States. Its first president was Roswell B. Mason.

The purpose of the society, as defined in its constitution, is the advancement of theory and practice of engineering, the improvement of the status of engineering practice as a profession, and maintenance of high professional standards. It represents all branches of the engineering profession and among the society's membership are representations from practically every type of business organization and institution of the nation.

The society has collaborated with the various engineering organizations on matters of national scope. During the past several years it has acted as sort of a postgraduate school whereby engineers were enabled to keep abreast of the latest developments in engineering science, by means of the reading of the various papers and discussions of engineering interest, which was accomplished by holding meetings at least once a week, also by the various inspection trips to plants and projects of special interest.

The society's library is one of the outstanding engineering libraries in this country. Here will be found more than twenty-three thousand volumes and pamphlets, carefully indexed, The library is kept up to date by frequent purchases and published reviews of new books, also the current issues of over two hundred trade and technical publications which are always to be found in the reading rooms of the society together with files of back issues of various publications. The indexes go even further than those published for general circulation and contain a great many references that are not found elsewhere.

The society administers or participates in four major honorary awards having as their purpose the recognition of engineering accomplishment and an incentive to engineers to excel in preparing and presenting engineering papers. These awards are the Octave Chanute Medal, The Washington Award, The Charles Ellet Award, and the Alfred Noble Prize.

Indiana Engineering Council Annual Meeting

Central Indiana and Fort Wayne Sections Join With Other Engineering Groups in Two-Day Professional Sessions

THE Engineers Annual Meeting was held on November 17–18, in the Claypool Hotel, Indianapolis, Ind. The meeting was held under the joint auspices of the Indiana Engineering Council and its affiliated organizations—The Indiana Section of the A.S.C.E.; the Central Indiana Section of A.I.E.E.; the Central Indiana Section of the A.S.M.E.; the Indiana Society of Professional Engineers; the Fort Wayne Engineers Club; the Fort Wayne Section of the A.I.E.E., and the Fort Wayne Section of the A.S.M.E.

Among the high lights of the two-day session were the address of welcome by General Robert H. Tyndall, Mayor of Indianapolis, and the banquet at which the Hon. Harley M. Kilgore, United States Senator from West Virginia, spoke on "U. S. Senate Bill No. 702, As It Affects Engineers," and the Hon. Raymond E. Willis, United States Senator from Indiana, discussed Senate Bill 702.

Papers presented at the November 17 session were on, "The Profession of Engineering," by D. B. Prentice, president, Rose Polytechnic Institute; "The Purdue University Research Foundation," by G. Stanley Meikle, director of Research Relations With Industry and Research Director of Purdue Research Foundation; "Anti-Friction Bearings," by Jerrus M. Bryant, chief engineer, Dodge Works, Link-Belt Company.

Five papers presented on November 18 were: "The Engineer and His Future," by Charles A. Powel, national president of the American Institute of Electrical Engineers and manager of Headquarters Engineering Department of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; "Co-Ordination of Power Supply in the War Effort," by Louis B. Schiesz, first vice-president of Public Service Company of Indiana, Inc., and president of Indiana Electric Association; "The Techni-

cian Versus the Engineer," by A. A. Potter, dean of engineering, Purdue University; "Collective Bargaining for Engineers," by Howard F. Peckworth, assistant secretary, American Society of Civil Engineers, and "The Value of Collective Bargaining for Professional Engineers and Technical Workers," by T. F. Doll, member A.S.C.E., Standard Oil Company, Whiting, Ind.

Anthracite-Lehigh Section Learns of Mobile Power Plants

Development of the mobile power plant was explained and illustrated to 135 members of the Anthracite-Lehigh Valley Section, at a dinner meeting in the Hotel Sterling, on November 3, by C. M. Rhoades, Sr., and F. S. Bennett, of the construction engineering department, General Electric Company, Schenectady, N. Y., and H. A. Stevens, mechanical engineer, American Car & Foundry Company, Berwick, Pa. With the mobile power plants built in Berwick jointly by the American Car & Foundry Company and General Electric for the Russian government, it was stated at the meeting that the first of the trains is now in operation in Russia, fulfilling its purpose while the last of the trains making up the order are now being completed. The plants are a development to provide emergency power to cities in war-devastated areas. The German demolitions in their retreat centered particularly on power facilities. C. M. Rhoades gave a general résumé; Mr. Bennett spoke on the 3000- and 1000-kw trains built at Berwick A.C.F., and Mr. Stevens discussed car construction and design problems in accommodating the power plant within the limitations of railroad rolling stock.

Ship Power Plants Subject at Baltimore Section

Members and guests of the Baltimore Section met at the Engineer's Club of Baltimore, Baltimore, Md., on November 27, to hear A. S. Thaeler speak on "Power Plants for Merchant Vessels." Mr. Thaeler briefly reviewed the various power plants in current use and gave some concrete facts covering space, weight, and maintenance characteristics.

Prof. A. de Forest Features Boston Meeting

Prof. A. V. de Forest of the Massachusetts Institute of Technology, lectured on "Wire Gages and Stresscoat as Applied to Problems in Stress Analysis," at the November 16 meeting of the Boston Section. He explained the principles of the operation of both in their application to measuring static and dynamic strains and illustrated his interesting talk with numerous slides.

"Normandie" Salvage Described at Central Illinois

Engineering high lights of the *Normandie* salvage operations were presented in an illustrated lecture by A. C. W. Siecke, at the November 9 dinner meeting of Central Illinois Section, held in the Jefferson Hotel, Peoria, Ill. Mr. Siecke said that approximately 700 men were regularly employed on the salvage job, which took about 18 months to complete. After operations were started, he added, it became necessary to install a controlled pumping unit and to set up a divers' school to offset the manpower shortage. This Section also reported that F. G. Ely, analytical engineer of The Babcock & Wilcox Company, New York, N. Y., was scheduled to speak on the subject of "Mobile Steam Power Plants," at the December 13 meeting.

Modern Fuel Factories Outlined at Central Indiana

The advantages, disadvantages, and methods of grading and washing coal by the flotation process were described by Charles H. J. Patterson to members of the Central Indiana Section when they met at the Antlers Hotel, Indianapolis, Ind., on November 10. Mr. Patterson offered numerous suggestions for the selection of proper installations.

General Business Meeting Held at Central Pennsylvania

The November 7 meeting of Central Pennsylvania Section, at The Pennsylvania State College, State College, Pa., was devoted to a general discussion of business, after which members and guests inspected the mechanical engineering laboratory.

"Choosing Proper Plastic" Is Subject at Chicago

Choosing the Proper Plastic, was the subject discussed by William O. Black, chief chemist, Chicago Molded Products Company, Chicago, Ill., at a meeting of the Chicago Section, on November 7. Mr. Black devoted his comments primarily to new developments in the plastic fields which he considered of interest to the mechanical engineer and designer. Prior to the lecture, members and guests viewed a technicolor motion picture entitled, "This Plastic Age."

25th Anniversary Year Begun by Colorado Section

This being the 25th Anniversary year of the Colorado Section, interesting and entertaining programs are being held, with a special "celebration" scheduled for the February meeting. Two noteworthy sessions of this significant term were recently reported as follows: On October 26, members and guests met in the Oxford Hotel, Denver, Col., to hear Louis Goalby and R. T. Barnum of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., lecture on "Electronics at Work for the Mechanical Engineer." Mr. Goalby explained the mechanical engineer's place in the development and application of electronics, while Mr. Barnum discussed the application of electronics in industry. A dinner meeting was held on November 16 in the Albany Hotel, Denver, at which C. F. Hansen, district sales manager, and F. L. Mosher, research engineer, both of Standard Stoker Corporation, gave a résumé of the "Development of Mechanical Firing for Locomotives and Mobile Power Plants." Mr. Hansen outlined the development of the stoker as applied to locomotives, after which Mr. Mosher discussed mobile power plants.

Joint Columbus Meeting on Aviation Attracts 110

The November 14 meeting of Columbus Section, at Battelle Memorial Institute, held jointly with members of the A.S.M. and A.W.S., featured a talk by Dr. C. C. Furnas, director of research, Airplane Division, Curtis-Wright Corporation, Buffalo, N. Y. One hundred-and-ten members and guests listened attentively to the speaker as he discussed the expected growth of the aviation industry as influenced by economics.

Glass Applications Related at Dayton Section

Possible uses of many "Fiberglas" products after the war were explained by James Slayter at a well-attended meeting of Dayton Section, held jointly with members of the Dayton Engineer's Club, at Dayton, Ohio, on November 14. Mr. Slayter, who is vice-president of Owens-Corning Fiberglas Corporation, Toledo, Ohio, emphasized the value of the product, particularly where strength, weight, and durability are important factors.

Detroit Section Learns of Helicopter Developments

Detroit Section met on November 7, in the ESD Auditorium, Detroit, Mich., to hear Col. H. F. Gregory, chief, Rotary Wing Branch, Wright Field, give some interesting "Facts About the Helicopter." Colonel Gregory also presented a film showing the development of the helicopter, another film depicting the activities of the Bell Aircraft Corporation in this field, while still another film described the operations being carried out by Aeronautical Products, Inc. Three-hundred members and guests were in attendance.

Fatigue Failures Subject at East Tennessee Section

At the November 21 meeting of East Tennessee Section, held at the University of Tennessee, Knoxville, Tenn., 125 members and guests heard Dr. S. P. Timoshenko speak on the subject of "Stress Concentration and Fatigue Failures."

Labor Problems Reviewed at Fort Wayne Section

An interesting lecture on, "Industry and Postwar Readjustment," was given by Thomas S. McEwan, at the November 2 meeting of Fort Wayne Section. Mr. McEwan briefly reviewed the present and postwar labor problems, particularly those problems facing management for reconverting plants to peacetime production.

Dr. S. P. Timoshenko Speaks at Greenville Section

Dr. S. P. Timoshenko spoke on the subject of "Stress Concentration and Fatigue Fail-

ures," at the November 17 meeting of Greenville, S. C., Section, held at The Manor, Asheville, N. C. Fifty-three members and guests attended the lecture.

New Officers Elected for Memphis Section

New officers for the coming year were elected at the November 15 meeting of Memphis Section. They are: C. K. Sharp, chairman; Col. J. R. Schneider, vice-chairman, and J. H. Tole, secretary-treasurer. Thomas H. Allen, J. J. Thomason, and W. H. Roberts were made directors, while R. M. King was appointed head of the Membership Committee. Prior to the election of officers, Dr. S. P. Timoshenko delivered an interesting talk.

Materials Handling Expert Heard at Mid-Continent

Ezra W. Clark, vice-president and general manager of Clark Tructractor, Division of Clark Equipment Company, Battle Creek, Mich., materials-handling expert and consultant to the Bureau of Service and Supply of the United States Armed Forces, discussed "Modern Materials Handling Methods," at the November 17 meeting of Mid-Continent Section, held in the Mayo Hotel, Tulsa, Okla.

Prior to the landing of American forces in North Africa and also before the invasion of France, Mr. Clark made a survey of all debarkation points in the United Kingdom for the United States War Department, and his recommendations, it is reported, were acted upon and followed in landings of American troops and supplies. Mr. Clark also made a survey of Pearl Harbor after the attack there and studied the Pacific Coast area from the standpoint of materials and equipment. It is his belief that the United States must develop a larger percentage of highly paid skilled labor, mechanically equipped, in order to compete with the tremendous volume of unskilled, low-paid labor, which will be available abroad in the postwar period. His contention is that "unskilled labor adds nothing to the product but cost."

A sound film originally produced for educational purposes in the armed forces and recently released for civilian review was shown to depict the modern methods used to handle materials.

Topic at Milwaukee Section Is "Electronics"

A brief review of "Electronics and The Mechanical Engineer," was presented by J. M. Gage, Electronic Division, Allis-Chalmers Manufacturing Company, Milwaukee, Wis., at the November 8 meeting of the Milwaukee section. Mr. Gage stressed the use of electronics in heating, control, and measurement and gave a detailed explanation of each application.

Aircraft Electronics Presented at Minnesota

A paper dealing with "Aircraft Electronic Applications" was presented at the November 16 meeting of Minnesota Section, held at the St. Paul Hotel, St. Paul, Minn. The guest speaker was A. P. Upton, chief electronics engineer, Minneapolis-Honeywell Regulator Company, Minneapolis, Minn., who supplemented his lecture by motion pictures of the C-1 Autopilot and the electronically controlled turbosupercharger for aircraft.

Refractories Discussed at New Haven Meeting

D. F. Sawtelle and Seaver Booth spoke on the subject of "Refractories for Metal-Melting Furnaces," at the November 8 meeting of the New Haven Section. Mr. Sawtelle described ferrous-metal applications, i.e., annealing kilns, air furnaces, cupolas, and electric furnaces, giving reason for the refractories used at Malleable Fittings Company, Branford, Conn., while Mr. Booth covered the copper-alloy melting applications in Ajax and Detroit Electric furnaces, as used at the American Brass Casting Shops, Ansonia, Conn.

T. C. Rathbone Is Guest of New London Section

T. C. Rathbone of the Fidelity & Casualty Company, New York, N. Y., was the guest speaker at the November 15 meeting of the New London Section, held in the Mohican Hotel, New London, Conn. Mr. Rathbone gave an informal talk on "Vibration and Vibration Isolation," using lantern slides and chalk sketches to illustrate his comments.

Three Prize-Winning Papers Submitted at Oregon

Carrying out a custom of over 25 years' standing, Oregon Section on November 17 awarded prizes for the three most interesting papers submitted by student members during the year. Prizes for the papers, presented by Junior members from the Oregon State College at Corvallis, Ore., were as follows: First prize—Richard Slatterly, for his paper on "Basic Tests for Small Boats;" second prize—Chester A. Peyronnin, Jr., who presented "Gas Turbines;" and third prize—David Kling, for his discussion of "Plywood in Aircraft Production."

Co-Operation Between Industry and Education Urged at Philadelphia Meeting

To maintain American industrial supremacy, future employers will find it imperative to require the keenest intelligence and highest skill in their personnel, said Arthur C. Harper, chairman, Committee on Education and Training for the Industries, at the October 24 meeting of the Philadelphia Section. In order to do this, Mr. Harper continued, industrialists and educators will have to think in terms of people and not in terms of things. He advocated the development of a system of technical institutes over the entire country in communities of more than 100,000 population immediately after the war, adding that industry's future depended upon the industrialists of today.

Pittsburgh Engineers Learn About Combustion Control

More than 70 members and guests of the Pittsburgh Section at the November 16 meeting in the William Penn Hotel, Pittsburgh, Pa., learned about "Combustion Control" from M. J. Boho of the Hagan Corporation, Pittsburgh. Mr. Boho outlined the importance of using automatic combustion control, particularly in connection with the newer type large steam generators, which he stated are more sensitive to load variations. A spirited discussion concluded Mr. Boho's remarks.

Plainfield Engineers Get Aluminum Alloy Details

Recent developments in aluminum alloys were given by Kenneth B. Baker, chief metallurgist of the Edgewater, N. J., plant of the Aluminum Company of America, Pittsburgh, Pa., at the November 15 meeting of Plainfield Section. Seventy-five members and guests attended the session, which was held in the Elks Club, Elizabeth, N. J.

Symposium on Carbide Milling Heard at Providence

A symposium on the development of high-speed milling cutters, together with the work of the A.S.M.E. Manufacturing Engineers Committee, was presented at Providence on November 7, by Herbert B. Lewis, Ferd W. Lucht, and A. W. Meyer. Mr. Lucht described the tools and important details on sharpening, and Mr. Meyer covered the subject of methods and use of carbide cutters.

Plastics Discussed at Joint Rochester Meeting

Dr. Garson Meyer spoke on the subject of "Recent Developments in the Field of Plastics," at the November 9 meeting of Rochester Section, held jointly with members of the Rochester Chemical Engineers Society and the Rochester Engineering Society, in the assembly hall of the Museum of Arts and Sciences, Rochester. By means of a molding press, electric heaters, and other equipment, Dr. Meyer very capably demonstrated the manufacturing fundamentals of plastics.

Executive Committee Meeting Held at Rock River Valley

Members of the executive committee of Rock River Valley Section held a meeting on November 10, to prepare plans for a joint session with the Rock River Engineering Council next February, and to hear a report by Mr. Fischer, chairman, on his activities at a recent regional conference. Various other business matters were discussed, after which the meeting adjourned.

Modern Petroleum Process Described at San Francisco

An interesting talk was given by Dr. Monroe E. Spaght at the October 26 dinner

meeting of the San Francisco Section, held in The Engineers' Club, San Francisco, Calif. Dr. Spaght told of modern petroleum processes, such as the synthetic-toluene projects for the manufacture of TNT, fluid catalytic cracking as used in the production of modern aviation gasoline, synthetic rubber produced from petroleum, and the like. He illustrated his talk with slides and exhibited samples of synthetic rubber and TNT produced from petroleum.

Society Affairs Analyzed at Southern California

Society organization and functions were covered by J. Calvin Brown and J. W. Eschelman in their report on "Section Delegate Group Conference," at the October 9 meeting of Southern California Section, held in the Los Angeles Athletic Club, Los Angeles, Calif. This Section met again on October 26, to hear Reagan C. Stunkel, general service manager, Lockheed Aircraft Corporation, Burbank, Calif., describe "Aircraft Operating Problems in the Theater of War." Mr. Stunkel described the type of facilities established at world-wide service depots, and with the aid of movies and slides illustrated actual facilities and combat damage, together with repairs effected. On November 14, the subject of "Design and Construction of Large-Diameter Oil Pipe Line," was presented by L. F. Scherer, assistant chief engineer, Texas Pipe Line Company, while on November 16, V. L. Pieckii read a paper entitled, "Economic Status of Young Engineers," and J. G. Eskin, one on "Instruments and Regulators."

Commander Hanson Talks on Antisubmarine Vessels at South Texas Dinner

At a dinner meeting on October 19, South Texas members were favored with a talk by Lieut. Comdr. G. B. Hanson on "Anti-Submarine Vessels in the Navy." Commander Hanson discussed the destroyer escort in detail, during the course of which he showed a film to illustrate his comments. After the meeting, members viewed a captured German film, "Invasion—Nazi Version," taken by a German cameraman on D-Day.

Susquehanna Learns About Product Design

Susquehanna Section opened its 1944–1945 activities with a dinner meeting in the Hotel Penn banquet room on October 9, at which Alonzo W. Huff was guest speaker. Mr. Huff, who is chief design engineer for the York Oil Burner Company, York, Pa., talked at length on the subject of "Basic Principles of Product Design."

Paint and Steel, Subjects at Western Massachusetts

New developments in protective coatings encountered in the painting business were discussed at a dinner meeting of Western Massachusetts in the Hotel Sheraton, Springfield, Mass., on November 21, by Merton E. Williams of Wilbur & Williams Company, Boston, Mass. Mr Williams outlined the common problems encountered in the painting business and explained that by the use of proper mixtures and types of binders, pigment, and body, most of these problems could be satisfactorily overcome. After a few introductory remarks, H. A. Ottey, manager of flanging sales of Lukens Steel Company, Coatesville, Pa., second guest speaker of the evening, showed two motion pictures. One depicted the manufacture of steel in the open-hearth furnace, while another showed the cladding of steel with monel and silver.

Capt. R. C. Kephart Addresses Western Washington Section

On November 1, Western Washington members heard Capt. R. C. Kephart talk on the subject of "Current Problems of Marine Machinery Engineering." He explained the difference between design of equipment for merchant vessels and warships and then discussed maintenance and repair difficulties encountered while in combat. At the conclusion of Mr. Kephart's remarks, members viewed two Navy films, one entitled, "War on the Sea," and one on the growth of naval aviation.

York Section Entertains Gas-Turbine Engineer

Fred K. Fischer was guest speaker at the November 16 meeting of York Section. Mr. Fischer, engineer of the Westinghouse Electric & Manufacturing Company, steam division, spoke on the subject of "Developments in Gas Turbines."

Powder Metallurgy to Be Discussed at Meeting of Junior Metropolitan Group, Jan. 23, 1945

METALLURGICAL as well as mechanical engineers will be interested in the subject of the January 23 meeting of the Metropolitan Junior Group. The timely topic is "Powder Metallurgy," a fast-moving and important development which everyone would like to know more about.

Prof. G. J. Comstock Speaker

There is no one who is a better authority on this subject than the speaker who is Prof. Gregory J. Comstock of Stevens University. Professor Comstock is director of powder metallurgy at Stevens and also serves as a consultant for several large war working firms, namely Crucible Steel Co. of America, American Machine and Foundry, and Aircraft Development Co. It is readily seen that because of Professor Comstock's wide and practical business experience this meeting will provide a fine opportunity for engineers in the New York area to get some up-to-date facts and information on this topic.

Just to mention a few applications of powder metallurgy would be the use of porous bearings, high-temperature refractory metals, metal fillers of controlled porosity, and special cutting surfaces. Powder metallurgy is a new technique of metal sintering which offers wide alloying and fabricating possibilities.

Dinner To Precede Meeting

The meeting is to be held in the second-floor dining room of Childs Restaurant, 109 West 42 St., at 7:30 p.m., preceded by an informal get-together at 6:00 and dinner at 6:30 to which all are invited. ($1.25 per person.) Those who cannot attend the dinner will be welcome at the meeting. The meeting is in charge of E. J. Nobles.

1944 Annual Student Luncheon Is Addressed by General L. H. Campbell, Jr., Chief of Ordnance, U.S.A.

President Gates Presides at Student Meeting, Introducing Professor Degler, Chairman of Committee on Relations With Colleges, and Charles E. Wilson, Toastmaster

IN attendance at the luncheon on Wednesday, November 29, in the ballroom of the Pennsylvania Hotel, during the 1944 Annual Meeting of the A.S.M.E., were many Navy men and students from colleges both far and near, all eager to take part in this annual student conference that has become such an integral part of the Society's program.

President Gates Greets the Meeting

After luncheon, President Robert M. Gates opened the meeting with greetings to the students and members and introduced President-Elect Alex D. Bailey of Chicago. Mr. Gates then commended the work of the Old Guard—members for over 35 years and therefore dues-exempt—who through voluntary contributions made possible a fund for entertaining and helping the student group of the Society. He also introduced the other guests at the speakers' table who were Dean George Leonard Sullivan, chairman-elect, Committee on Relations With Colleges; Colonel James L. Walsh, chairman of the A.S.M.E. War Production Committee; DeGaspe Beaubien, president of The Engineering Institute of Canada; Carl L. Bausch, chairman of the Board of Honors and Awards; L. Austin Wright, secretary of The Engineering Institute of Canada, and Col. C. E. Davies, secretary of the A.S.M.E.

Professor Degler Thanks Old Guard

Prof. Howard E. Degler, chairman of the Committee on Relations With Colleges, was the next speaker. He thanked the Old Guard for their co-operation through the years in providing prizes and other benefits for students and mentioned the 120 student branches of the A.S.M.E., comprising 4000 members. He also thanked the Board of Honors and Awards for their co-operation in making possible the awarding of prizes in connection with the work of the students throughout the country. He introduced the winner of the Charles T. Main award for 1944, Fred M. Piaskowski, who is working for a B.S. degree in mechanical engineering at the University of Detroit. Mr. Piaskowski had previously attended the University of Detroit, but in his third year he was employed by the Wolverine Tube Co. on a co-operative basis and in 1940 he dropped his work at the University and for three years was engaged in the production of vital war goods in the capacities of draftsman, tool designer, and plant engineer with the Wolverine Company, Nash-Kelvinator Corporation, and C. J. Martin & Sons. He re-entered the university in 1943. His paper which won the award was "A Case-Study of Labor-Management Co-Operation."

Professor Degler then presented the undergraduate student award of 1944 which is for a paper on any subject, to Nelson Browne Hammon, an undergraduate at the University of Pennsylvania. His paper was entitled "An Investigation of Silver-Solder Penetration in Brass Joints." He is now studying mechanical engineering at the University.

Charles E. Wilson, Toastmaster

Mr. Gates next introduced as toastmaster Charles E. Wilson, president of General Electric Co., New York, N. Y.

Mr. Wilson said that we all do a certain amount of speculation about what the reaction of the returning soldiers is going to be when the war is over, what stories they are going to tell us, and their reactions economically and politically. He felt that one reaction was likely to stand out from all others, i.e., that they have had the finest quality of design and greatest quantity of weapons and ammunition. He said that this magnificent result which the boys will speak of didn't just happen; there had to be a great spark plug to bring about this result. The man who was that spark plug had magnificent engineering knowledge of arms and ammunition through many years of hard experience; he was therefore able in this tremendous emergency to organize and put together the magnificent system of manufacture and supply in arms and ammunition that the enemy is feeling the result of today. This man was an engineer, and the least of our troubles in Washington, said Mr. Wilson, had to do with Ordnance, because the man in charge was an engineer with great administrative genius. He then introduced Major General Levin H. Campbell, Jr., Chief of Ordnance of the U. S. Army, the man who laid out this tremendously effective system which has given such an account of itself.

Major General Campbell, Speaker

General Campbell in a brief talk said he deserved no credit for the accomplishments of the Ordnance Department, which is 132 years of age; he was the sixteenth or seventeenth Chief of Ordnance. He said that his department had the patina of age and every one of the Ordnance Department employees has added a grain of sand on the pile of knowledge; that today he and his fellow workers found themselves on the top of the pile and are in turn trying to add a grain of sand. With the help of industry, he said, the results are speaking for themselves. He expressed the heartfelt gratitude of the Ordnance Department to the A.S.M.E. for the success of the armament program and expressed the hope that this close co-operation may continue without interruption through the peacetime era. He felt that the A.S.M.E. is looking ahead, planning for the days of peace, as the Ordnance Department is also planning for the future. A plea for ordnance research and development for peacetime, he pointed out, is now due serious consideration. It was his frank belief, General Campbell said, that our weapon supremacy is in direct ratio to the time engineering, technical, and scientific societies spend on research and the money allotted to armament. General Campbell's talk is published in full in this issue, pages 23 and 24.

Branch Meetings

Two motion pictures featured the November 2 meeting of NEW YORK UNIVERSITY BRANCH (Day), held jointly with Aero Engineers and night students. One picture was entitled, "Manufacture of Plywood," while another picture, lent through the courtesy of United States Steel Corporation, New York, N. Y., depicted the manufacture and processing of steel.

Evening Branch, N. Y. U., Reports Election of New Officers

NEW YORK UNIVERSITY EVENING BRANCH elected new officers at its October 25 meeting. They are: Stephen J. Rudy, chairman; Carrol T. G. Murphy, vice-chairman; Cyril G. Glickman, secretary, and Chew Yun Tung, treasurer. The new chairman then appointed Robert Wood chairman of the membership committee and Miss Charlotte H. Northcote, chairman of the program committee. Prior to the election of officers, members viewed a General Electric film on "Steam Turbines."

Members of NORTHEASTERN BRANCH met on October 31, to prepare plans for a smoker and to hear a paper on "Aircraft Stability," prepared by Orin Smith, member of the class of 1946. This Branch held its smoker on November 9 in honor of the senior class which was to graduate in December. Entertainment was provided by Jess Kelly, magician, after which Joseph Crech gave a lengthy discussion on the practical problems encountered in power and domestic steam heating plants.

The featured speaker at the October 17 meeting of OREGON BRANCH was Professor Graf, head of the Mechanical Engineering Department. He devoted his talk to "Engineering Societies and Organizations," discussing especially the purpose of the various organizations, how they function, and the value of each. Prior to Professor Graf's comments, members elected new officers as follows: David Kling, chairman; Thomas Feazel, vice-chairman; David Offner, recording secretary; Robert Billig, corresponding secretary; Richard Slattery, treasurer; Ned Mitchell, librarian, and Richard Parrish, sergeant-at-arms. This Branch met again on November 2 to view two movies, "Miracle in Wood," and "Mission Accomplished." Plans for two inspection trips were also discussed—one to the M.&M. Wood Working Company, Albany Plywood Division, and one to Portland, Ore., for a joint meeting with Oregon Section.

POLYTECHNIC INSTITUTE OF BROOKLYN BRANCH (Day) held a reorganizaton meeting on November 14 and elected officers for the new term. Prof. E. F. Church was elected honorary chairman; Irwin Stern, chairman; Robert Daniels, secretary, and Albert DeGaeta, treasurer. The new chairman then appointed various committee heads as follows: Program, F. Raffa and S. Kelly; publicity, Mr. Monahan and Mr. Meyer, and refreshment, R. Petersen and R. Olsen.

Responsibilities of an Engineer Pointed Out at Purdue Meeting

Engineering college graduates should make every effort to select a position for the experience and training it offers rather than for its financial status, Robert M. Gates, national president of the A.S.M.E. told members of PURDUE BRANCH on October 20. He urged the young engineer to join professional societies and stressed the importance of participating in civic organizations. At the same meeting, Mr. Gates was initiated into Pi Tau Sigma, Honorary Mechanical Engineering Fraternity, after which he was honored at a Pi Tau Sigma-A.S.M.E. banquet. President E. C. Elliott of Purdue University was guest speaker at the banquet, while Mr. Gates, Prof. H. L. Solberg, and Prof. D. S. Clark were asked to make brief remarks.

PRESIDENT R. M. GATES (1944) AND PROF. H. L. SOLBERG AT PURDUE BRANCH MEETING, OCT. 20

A film, nontechnical, of the Ford Motor Co. entitled "Symphony in F" was shown at QUEEN'S UNIVERSITY BRANCH meeting October 31, 1944. Austin Hopkins, a third-year student, gave an interesting talk on refrigeration which was well-illustrated, with Jack Mowbray assisting at the lantern. On November 4 the Branch toured the Canadian Locomotive Works. The high light of the trip was the inspection of the large-type locomotive nearing completion. On Nov. 10 the Branch visited the Royal Canadian Ordnance and Royal Cana-

dian Electrical and Mechanical Engineers Training Center. Sixty branch members found this tour extremely interesting, for all phases of the technical training of the R.C.E.M.E. were shown.

Plans were briefly discussed for future activities by members of ROSE POLYTECHNIC BRANCH on November 15, after which new officers were elected. They are: Robert Gillum, chairman; Robert Kays, vice-chairman; Stephen Liddle, secretary; Don Keisten, treasurer, and Edward Eckerman, honorary chairman. John Lee was named chairman of the activities committee.

Charles O. Heath was elected honorary chairman of RUTGERS BRANCH at the first meeting of the fall term on October 26. Other new officers elected are: Thomas K. Gibson, chairman; Russell H. vom Lehn, vice-chairman; Michael W. Slavic, secretary-treasurer. Plans also were discussed at this session for an inspection tour of the Steam Power Station of Calco Corporation, Bound Brook, N. J.

Opportunities open to students by membership in the A.S.M.E., together with a short résumé of the history of the Society, were given by Prof. S. F. Duncan, honorary chairman, at the November 15 meeting of UNIVERSITY OF SOUTHERN CALIFORNIA BRANCH.

The main purpose of the November 8 meeting of STEVENS INSTITUTE OF TECHNOLOGY BRANCH was to elect new officers, with the following appointed to office: S. F. Dankenbring (incumbent), chairman; R. W. Reddington, vice-chairman; J. W. Schindeler, secretary, and G. M. Homewood (incumbent), treasurer. At this session it was also decided to hold biweekly meetings, these to feature either a movie or lecture on subjects pertinent to the training at Stevens. Plans for a smoker and one field trip to a nonwar industry were also discussed.

"This Plastic Age"

A motion picture, sponsored by the UNIVERSITY OF SOUTHERN CALIFORNIA BRANCH was shown before 25 members on Nov. 28, 1944. This film, entitled "This Plastic Age," was considered by the audience to be the best picture on plastics ever shown at the campus.

On Nov. 29 President Ken Macleod opened the meeting when the organization of a volleyball team was discussed, in order that the A.S.M.E. SOUTHERN CALIFORNIA BRANCH might challenge the A.S.C.E. Branch at the University to a game of volleyball. Don A. Quinn was then entertained as a student speaker. He gave an interesting technical report of his engineering experiences in the Construction Battalion on Dutch Harbour during the early part of the year 1943.

Daniel Wingerd was elected chairman; John Kelly, vice-chairman, and John Easter, secretary-treasurer of SWARTHMORE BRANCH on November 22. After the Program Committee was instructed to prepare a schedule of future programs for presentation at the next session, the meeting adjourned.

Prof. F. H. Thomas, honorary chairman, discussed the many opportunities open to student members by membership in the A.S.M.E., at the October 18 meeting of TENNESSEE BRANCH. Prior to Professor Thomas' talk, officers for the Fall term were elected as follows: Thurman C. Hardin, chairman; Robert A. Harper, Jr., vice-chairman, and Mary Porter Fain, secretary-treasurer. This Branch held a joint meeting on November 1, with members of the A.I.Ch.E., at which a movie on the Fulton sylphon bellows was shown, and Professor Mack discussed the different aspects of metal bellows. Prof. E. S. Fabian featured the November 15 meeting of this Branch, speaking on the subject of "Aviation." He talked at length of the aviation program now being formulated at the University of Tennessee.

TUFTS BRANCH held a brief meeting on November 21 to elect new officers and to prepare a tentative program of future activities. Roger C. Tenney was elected chairman; W. H. Campbell, vice-chairman, while R. D. Smith was retained as secretary-treasurer.

"Mercury Binary Cycle" was the student paper presented by Burns Dews at the November 9 meeting of TULANE BRANCH. At this session, the possibility of presenting two student papers at future meetings, with an award for the one voted best, was considered, after which a tentative field trip to the Market Street Power Plant, New Orleans, La., and a beer party were discussed.

Diesel and Electric Trains Versus Steam Discussed at Virginia

Advantages of Diesel and electric trains over steam, and an illustrated account of the comforts and principles of operation involved in the latest streamline trains, were presented by Prof. R. W. Morton at the October 9 meeting of VIRGINIA POLYTECHNIC BRANCH. At the October 16 meeting of this Branch, Prof. J. B. Jones, head of the Mechanical Engineering Department, discussed the value of the A.S.M.E., while the October 23 meeting featured a film depicting the important role the railroads have played in the development of America, and an interesting talk by a student member of the A.S.M.E., R. W. Hamel, on the Norfolk and Western streamlined steam locomotive.

A successful smoker was held in the Top Flight Room of the Wisconsin Memorial Union, on November 7, by the Mechanical Engineering Society of WISCONSIN, which is a combined organization of the A.S.M.E. and S.A.E. student chapters at the University of Wisconsin. After a brief discussion on the value of the organization by William Wendt, the 70 members and guests in attendance enjoyed a motion picture entitled, "Tank Destroyers."

Fewer meetings but with good speakers were decided upon at a brief business session of WORCESTER BRANCH on November 7. It was planned to have at least one speaker on postwar opportunities and to invite a machine-gun inventor, possibly O. T. Paine of Worcester, Mass. The meeting adjourned after F. T. Miller was elected vice-president.

Student papers presented at the November 14 meeting of YALE BRANCH were as follows: "Penicillin," by R. Bernstein; "Radio Tubes," by J. D. Hopkins; "Practicality to the Ultimate," by S. Lampert, and "Jet Propulsion," by W. Plamondon. Before the papers were read, it was decided that the new officers—M. Whiting, chairman; J. D. Hopkins, treasurer, and H. R. Taylor, secretary, represent this Branch at the Annual Meeting of the A.S.M.E., New York, N. Y., November 27–December 2.

Engineering Societies Personnel Service, Inc.

These items are from information furnished by the Engineering Societies Personnel Service, Inc., which is under the joint management of the national societies of Civil, Electrical, Mechanical, and Mining and Metallurgical Engineers. This Service is available to members and is operated on a co-operative, nonprofit basis. In applying for positions advertised by the Service, the applicant agrees, if actually placed in a position through the Service as a result of an advertisement, to pay a placement fee in accordance with the rates as listed by the Service. These rates have been established in order to maintain an efficient nonprofit personnel service and are available upon request. This also applies to registrants whose notices are placed in these columns. All replies should be addressed to the key numbers indicated and mailed to the New York office. When making application for a position include six cents in stamps for forwarding application to the employer and for returning when necessary. A weekly bulletin of engineering positions open is available to members of the co-operating societies at a subscription of $3 per quarter or $10 per annum, payable in advance.

New York 8 West 40th St. **Boston, Mass.** 4 Park St. **Chicago** 211 West Wacker Drive **Detroit** 109 Farnsworth Ave. **San Francisco** 57 Post Street

MEN AVAILABLE[1]

MECHANICAL ENGINEER, broad practical experience, wants opportunity to head design, development, model production departments for small independent progressive organization interested in quality light machinery or products. Prefer Northeast or South California Coast. Me-878.

EXECUTIVE ENGINEER (industrial) age 49, A.S.M.E., with wide experience in manufacturing production, management, and labor relations, interested in making connection with small manufacturing industry located in Southeast, preferably Georgia. Me-879.

CHIEF ENGINEER, Registered Professional Mechanical Engineer. Recent experience assistant chief engineer on design and construction $28,000,000 bombloading plant. Experienced in design, construction, maintenance, Diesel, steam, and hydroelectric power plants. Me-880.

MECHANICAL ENGINEER, B.S., 23 years old, married, desires position with small New

[1] All men listed hold some form of A.S.M.E. membership.

England industry. Two years' experience with naval and commercial mechanical and Electrical marine installations. 4-F classification. Me-881.

ENGINEER EXECUTIVE, 52, graduate mechanical engineer, member A.S.M.E., broad experience in design and production, shop, general management, and sales of hydraulic machinery, machine tools, die castings, plastics, metal products. Languages. Me-882.

POSITIONS AVAILABLE

SALES REPRESENTATIVE, 30–40, mechanical engineering graduate. Will be responsible for sales promotion and act in advisory capacity to factory about to be started with local capital, maintain good relations with government and other industries. Must have practical knowledge of production problems and know or learn Portuguese, with knowledge of Spanish desirable. $5000–$6000 year. Brazil. W-4661.

SAFETY DIRECTOR, graduate mechanical engineer, 35–40, with at least 5 years' safety engineering experience, preferably with large integrated metal concern. $4800–$6000 year. Will supervise safety programs in numerous plants. Headquarters, South. Interviews, New York, N. Y. W-4670.

TOOL DESIGNER AND A PROCESS ENGINEER, or one person combining both qualities. Must be familiar with tool processing, tool designing, and the mechanical setup for the production of small steel and brass parts made on automatic screw machines making lathe parts, turret lathes, process, and die equipment. Postwar opportunity. Salary open. Pennsylvania. W-4681.

MECHANICAL ENGINEER familiar with methods of granite quarrying and fabricating machines used. Experience in heavy machines such as mining, construction, or railroad machinery would be considered. Should be able to make own calculations and design equipment. Salary open. New Hampshire. W-4686.

UTILITY ENGINEER to be in charge of boiler house, heating, air conditioning, compressed air, gas and water systems, hydrogen generating plant, and other utilities. Should have good theoretical background and some experience along these lines. Pennsylvania. W-4689.

PUMP DESIGNER experienced on high-pressure rotary displacement pumps for industrial or aircraft hydraulic systems. Opportunity in postwar development program. $5000 or more year. West Coast. Interviews, New York, N. Y. W-4690-S.

METHODS ENGINEERS with experience in methods and time study, working with shopmen in developing better methods, plant layout, work-place layout, operator training, motion economy, and general factory work in metals-fabricating plants. Maryland. W-4701.

ASSISTANT CHIEF ENGINEER, 30–45, mechanical graduate preferred, with experience in design of pressure-containing vessels and supervision of draftsmen. Must have designing and creative ability. Permanent, good opportunity. $5000–$6000 year. Ohio. W-4706-D.

GENERAL SUPERINTENDENT AND MANUFACTURING EXECUTIVE, 45–50 preferred, with experience in production manufacturing, particularly in heavier industries, such as forgings, etc. $10,000 year. Western Pennsylvania. W-4711.

SERVICE DEPARTMENT MANAGER with intimate knowledge of manufacturer's service and installation policies as applied to air conditioning, commercial refrigeration, equipment, and major appliance products. Must have ability to establish economical, practical, and efficient field-service organization. Will work closely with sales, manufacturing, engineering, financial, procurement, and personnel departments. $8000–$10,000 year. New York State. W-4715.

ENGINEERS. (*a*) Production manager, mechanical graduate preferred, with experience in supervision through foremen of all production departments. Must have experience in fabrication and assembly of small interchangeable parts such as instruments, radio, etc., and be capable of setting up various operations to obtain peak production by most economical methods. $4800 year. (*b*) Mechanical engineers, graduates, with at least one year's experience in development and design of small instruments such as pressure gages, aircraft instruments, etc. $3900–$4560 year. (*c*) Time-study engineer, mechanical graduate preferred, with experience in conducting studies to ascertain amount of time spent by workers on completion of particular duty; devise methods to improve efficiency and reduce waste, etc. $2860 year. Pennsylvania. W-722.

INDUSTRIAL ENGINEER with considerable experience in organization planning and systems for company specializing in strong alloys, i.e., sheet rod extrusion products, forgings, etc. Must have good personality. About $5000 year. Kentucky. W-4731.

MECHANICAL ENGINEER with design and layout experience on pressure vessels and gas equipment. Must have some plant maintenance experience. Temporary. $5000–$6000 year. Ohio. W-4734.

CHIEF PRODUCT ENGINEER, 35–45, mechanical engineering graduate, to manage product design division in hardware manufacturing plant. $5000–$8000 year. Connecticut. W-4737.

CHIEF ENGINEER, 40–45, to take charge of engineering department of large, essential, nationally known manufacturing concern, operating large number of plants throughout the United States and in many foreign countries. Experience in process engineering, construction engineering, and general supervision of plant engineering work in industrial, chemical, or food-processing fields necessary. Will act as assistant to chief engineer, who plans to retire when his successor has demonstrated to him that he is well grounded technically to assume direction of engineering department and has ability to enlist the zeal of engineering staff and the co-operation of factory managers. Must have professional engineering license. $15,000 year. New York, N. Y. W-4748.

PERSONNEL DIRECTOR for chemical plant employing between 800–1000 employees. Must have had some experience with labor unions, accident, and personnel-relation services. $6000 year, plus overtime and 10 per cent W.T.A. allowance. New York, N. Y. W-4753.

DIRECTOR OF TRAINING for a metal plant of 1000 employees. Must have complete knowledge of job instruction training, particularly as given by War Manpower Commission. $5200–$6000 year. New York, N. Y. W-4771.

DRAFTSMEN AND JUNIOR DESIGNERS wanted for war work with ideal peacetime future. Piping or oil-field experience preferred but not essential. Salary dependent upon experience. Kansas. W-4784-C.

DESIGNER. Experienced designer with thorough knowledge of modern machine-tool design practice. Excellent position for top-flight man. For personal interview, please write giving full details including salary expected. All applicants subject to labor stabilization rules. Western New York State. W-4805.

Candidates for Membership and Transfer in the A.S.M.E.

THE application of each of the candidates listed below is to be voted on after January 25, 1945, provided no objection thereto is made before that date, and provided satisfactory replies have been received from the required number of references. Any member who has either comments or objections should write to the secretary of The American Society of Mechanical Engineers immediately.

KEY TO ABBREVIATIONS

Re = re-election; Rt = reinstatement; Rt & T = Reinstatement and Transfer to Member.

NEW APPLICATIONS

For Member, Associate, or Junior

ALLEN, JOSEPH F., Cleveland, Ohio (Rt & T)
ALLWORK, RONALD, Chevy Chase, Md.
AUMENTA, JOSEPH E., Jersey City, N. J.
BAER, SIMON, Forest Hills, N. Y.
BARNETT, ERIC, San Francisco, Calif.
BARONE, DAVID BENNETT KING, Rosedale, N. Y.
BARRIGER, JOHN, Glencoe, Ill.
BARTHELEMY, C. R., St. Paul, Minn.
BAUDER, BURTON E., Newark, N. J.
BENES, GASPAR P., Cleveland, Ohio (Rt)
BORCHARDT, WILLIAM J., Cleveland Heights, Ohio
BOSOMWORTH, G. P., Akron, Ohio
BOYD, KENNETH R., Rochester, N. Y.
BOYEN, JOHN L., Orinda, Calif.
BROWNE, KENNETH A., Cleveland, Ohio
BURTON, WALTER MCKINLEY, Oneida, N. Y.
CAUGHEY, CLARENCE H., Aurora, Ill.
CHODOROWSKI, EMIL G., Beechhurst, N. Y.
CHURCHMAN, H. N., Baltimore, Md.
CONDIT, MERLYN E., S. Charleston, W. Va.
CONSTABLE, T. A., Webster Groves, Mo.
CORBETT, CHARLES H., Belleville, N. J.
COSTIGAN, JAMES T., New York, N. Y.
CUMMINGS, EDGAR H., Cleveland Heights, Ohio
CURTIS, ELBERT D., Huntington Park, Calif.
DELLINGER, L. M., Baltimore, Md.